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RISK MANAGEMENT APPLICATION FOR THE IATA E-FREIGHT INITIATIVE IN AIR CARGO INDUSTRY

Master of Science Thesis

Examiner: Prof. Jorma Mäntynen
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ABSTRACT

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E-freight is air cargo industry-wide project that aims to remove paper from the process of freight movement. International Air Transport Association (IATA) originally initiated this project in 2007. At the time of its initiation air cargo sector was heavily relied on paper-based processes, and all documents were flowing between the air cargo supply chain members starting from a consignor and finishing at consignee. E-freight promises to bring significant benefits such as cost savings, quality and reliability improvements, visibility, speed, simplicity and regulatory advantage. But high complexity in air cargo supply chains makes the process of documents digitalization very challenging and sophisticated for all the stakeholders involved. Complexity entails risks based on the interdependencies between the process participants that have to be identified to ensure e-freight successful implementation for all parties.

This study is based on the research in Finnish air cargo industry. The objective of this work is to identify risks and apply risk management practices to the IATA e-freight initiative in order to provide a model that could be widely applicable for other industries with complex supply chains. The objective is achieved by focusing on separate supply chain members' perspectives, analyzing the gaps between the real situation and the desired, and identifying the biggest risks for industry-wide project implementation.

Finnish air cargo industry is selected as an example of an industry currently entering the digital way of information exchange. Thus, interviews and questionnaires distribution were arranged with the professionals from companies' both management and operational level. The results of the study show that besides the fact of the highly industrialized information technologies solutions developed for e-freight project, human factor still plays the major role in the industry-wide project adoption. Such factors as reluctance for a change, chained paper-based traditional processes, weak preparation and testing phases of IT solutions slows down e-freight implementation significantly. Highly interdependent supply chain players affect operational level decisions of each other due to the listed factors, and, at the same time may have an impact on strategic decisions.

PREFACE

The idea of the topic of this paper originally came from the time of having Internship at Lufthansa Cargo, Helsinki in the beginning of 2014. For about six months I was grasping new knowledge about air cargo industry and finally found a topic of e-freight very interesting and quite challenging. E-freight was a good choice by means of the modern technological industry solutions and all the trends towards saving environment and improving quality of logistics operations. More to say, this industry-wide project for more than five years goes live in many countries worldwide and finally, in August 2014, starts in Finland. To support the process of e-freight implementation, risk management direction was chosen as a point of my research departure.

I would like to thank my supervisor Prof. Jorma Mäntynen for his guidance and critical analysis during the study development. It was difficult to find a person who was able to guide me in the topic of air cargo, and this person helped me to do the right choice. Also I would like to thank all the professionals who found time to answer my questions during personal interviews, focus group meeting or by responding to my questionnaires.

Finally, I am thankful to my loving mother and father for their constant and great support at all stages of my studies abroad. And my sincere gratitude is referred to Paul Mann whose care made everything possible for me.

November, 2014

Tatyana Chernova

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ABBREVIATIONS

AWB	Air Waybill
B2B	Business To Business
B2C	Business To Consumer
EAWB	Electronic Air Waybill
EDI	Electronic Data Interchange
FIATA	International Federation of Freight Forwarders Associations
GACAG	Global Air Cargo Advisory Group
GHA	Ground Handler Agent
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IT	Information Technologies
XML	Extensible Markup Language

1. INTRODUCTION

1.1 Background

Nowadays paper documents mandatory follow the carriage of goods during their way from the origin to the destination point. Transportation process is fully documented and any interchange is a normal process for all participants. Therefore, air cargo supply chains are highly regulated and correspond to all the international laws. It is impossible to underestimate the role of air transport in global economies. IBIS World (2012) reports that air cargo industry generates 50 billion Euros, employs 260,000 people worldwide and transports about 40 millions of freight annually. Not only airlines, but all other supply chain stakeholders clearly create substantial value for consumers and the broader economy (IATA Economics Briefing №10, 2013). To remain competitive and to enhance quality, reduce waiting times, to eliminate paper handling costs, highlight visibility, speed and positioning in the transport sector, International Air Transport Association (IATA) introduced a paperless initiative in 2004 called e-freight.

Digitalization of core transport and commercial documents is the main idea of e-freight. Introduction of integrated information technology platforms and electronic data interchange messaging aim to replace fully the physical documents flow in conjunction with freight. To enable this change, participants must use in-house technology to be linked to the partners, use tools provided by their partners or be supported by third parties providers (IATA Handbook, V.4.0, 2013). IATA highlights that airlines, freight forwarders, ground handlers, shippers, and customs authorities are aligned with the need for modernization (IATA Annual Review, 2014).

A way towards paperless already took few years and many pilot projects were started in a worldwide scale. Due to the fact that structure of air cargo supply chains is similar for different countries, an introduced in 2012 industry “three-pillar” roadmap addresses key factors that support driving a change towards paperless. But still, the level of industry development, involvement into international projects and in places high attachment to traditional paper-based processes slows down or interfere successful implementation of such projects as e-freight. Thus, it is vital to know how big the gaps between the real situation and the desired plans, to evaluate barriers that can have an impact on supply chain stakeholders’ plans for project execution, and to investigate dependencies in complex supply chain to foresee the consequences of harmful scenarios, if any.

1.2 Problem of the study

The transportation of goods by air is constantly developing, its roots dated back to early 1900th and, nowadays, it is a key component of world trade (Sales, 2013). This progress is obvious when comparing data and facts for every five or ten years of an industry lifecycle. Air cargo approved itself as a very powerful player in B2B world. Therefore, these business activities are highly regulated and secured.

This paper is based on the subject gained during a working period for international air cargo company. Due to the specifics of the company processes and ongoing projects, company case study idea was replaced with the purpose to study a broader spectrum of activities in air cargo supply chains (Figure 1). Therefore, topic of e-freight as an innovative industry-wide initiative became a central focus of this study.

Figure 1. Air cargo supply chain (IATA Handbook V.3.1,2012) .

As shown in Figure 1, there are different players comprising air cargo supply chain, and e-freight project implies on their great involvement into changes towards paperless. But in reality, there are difficulties in getting implementation process on a right track. All stakeholders are mostly different organizations connected by the operations of handling cargo and delivering it to the final destination. All of them have their own unique structure, mission, capabilities and ways of doing business. Therefore, weakness or unreadiness of some supply chain members can lead to the implementation process interruptions or other associated difficulties. This situation is reflected in harmful consequences for operations quality, their organization and industry-balanced coordination. Additionally, addressing IATA e-freight goals and deadlines are placed in question. In reference to the limitations of this study (section 5.3), all listed issues lead author to the objective of this paper discussed in the following section.

1.3 Objective of the study

Despite the planned IATA e-freight project timeline, implementation process goes differently in particular countries. With the given step-by-step instructions how to adopt e-freight, companies advised, or, in some cases forced, to proceed to the real actions. In

this situation it is important to understand diversity of companies involved in air cargo business who are the parties of a supply chain.

Empirical study is based on the idea to investigate scenarios and conditions that can affect implementation of e-freight project in the air cargo industry. Existing plan of adopting e-freight can be considered just as a general toolkit for all stakeholders involved. Thus, the objective of this study is…

…to investigate risks and apply risk management practices to the IATA industry-wide initiative of e-freight implementation.

In other words, this study tries to give some insights into the e-freight project where possible risks are not discovered or still underestimated. Paper focuses on risks identification and risks analysis as the first steps of risk management process. Diversity of companies in air cargo industry does not allow unifying the strategy to avoid problems, but having them identified might bring considerably positive results to the business processes of all parties involved.

1.4 Overview of the air cargo industry

Air cargo industry remains requisite for a variety of industries that require transport of time-sensitive commodities such as perishables, consumer electronics, fashion apparels, pharmaceuticals, machinery an high-value intermediate goods (Boeing, 2013). Quality improvements such as shortening lead times, greater flexibility with more fleets and enhanced security technologies ensure air cargo industry will continue to play a leading role in transportation for a global economy. As stated by Airbus (2013), data on trade volumes is a key driver for air cargo traffic forecasting. And, the biggest driving force for the ait freight development is in dynamism of the emerging economies.

According to Boeing report (2013), air cargo's traffic annual growth of 5.4% was shown for the period between 1993 to 2008, but it was decelerated to the point of 1% growth in 2008. However, the following deep recession strongly curbed trade and air cargo growth (Figure 2). Based on the data source, there is a little evidence that supply chains are becoming less global; high-value merchandise trade is forecast to expand for about 5% per year through 2030 (Boeing, 2013).

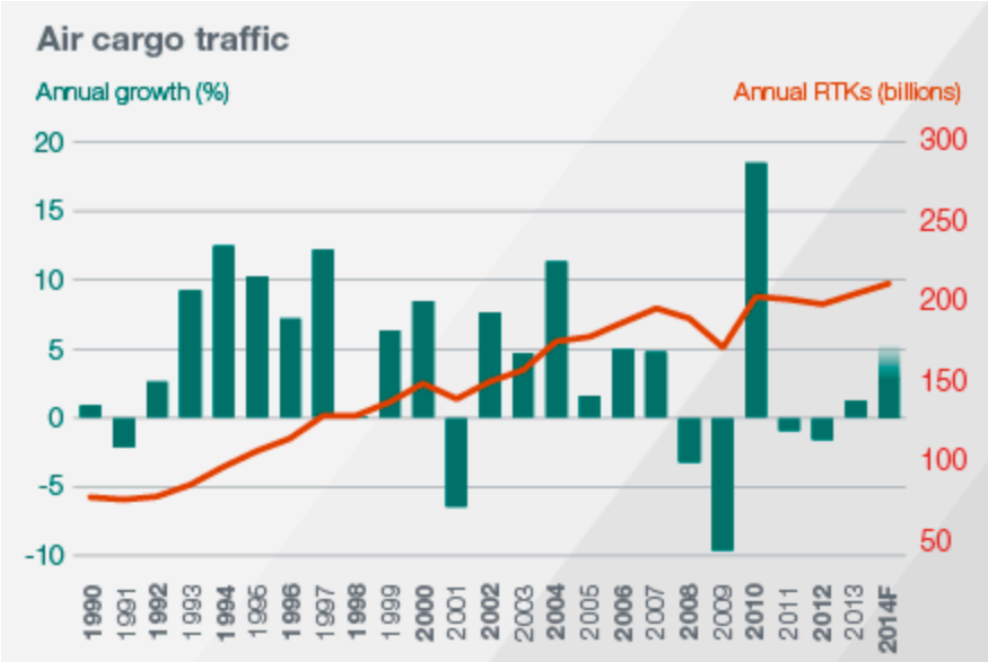


Figure 2. Cargo market annual growth (Boeing, 2013).

However, there is a great threat for air industry in face of the maritime goods transportation. It is mostly determined by the changing trends in mix of commodities in a global trade: high-tech and fashion goods have practiced rather slow growth for the last 13 years whereas raw materials and chemicals (lower-priced sea freight) have been on a rise (Forbes Journal, 2014). To address all the challenges from pressing industry shifts towards maritime and rail transport, air cargo is enhancing the competitiveness of air freight by the number of interconnected work programs (IATA Annual Review, 2014). They are:

- E-freight implementation by replacing paper analog processes with digital data transfer
- Minimizing security-related delays by ensuring a secure supply chain
- Intensive application of quality management and benchmarking procedures to measure the performance of the end-to-end air cargo chain
- Global facilities matrix developing to benchmark air cargo infrastructure, especially with a reference to a cool chain
- Global standards penetration to raise air cargo safety
- Ensuring closer partnerships between the stakeholders in the air cargo value chain by fostering them.

On a long-term horizon, the industry remains to feel the impact of modal loss, overloading, sourcing shifts, service issues and growing isolationism (Forbes Journal, 2014). Brian Pearce, chief economist with IATA, says: “The days of very rapid growth in air cargo industry probably won’t come back”. However, as Schiphol Cargo Development

Director Saskia van Pelt commented, e-freight helps to reduce costs, improve efficiency and speed, it is also environmentally responsible and helps to differentiate air cargo from other transport modes. This statement highlights the realities of cargo business where growing does not necessarily mean increase in demand, but more likely it depicts the change in market sharing. It is believed that enhancing the competitiveness of goods transportation by air is a challenge to be addressed by e-freight industry-wide project.

1.5 Structure of the thesis

This master thesis is split into five chapters that logically represent introduction, research structure and methods, theoretical background, empirical study and conclusions. The structure is illustrated in Figure 3.

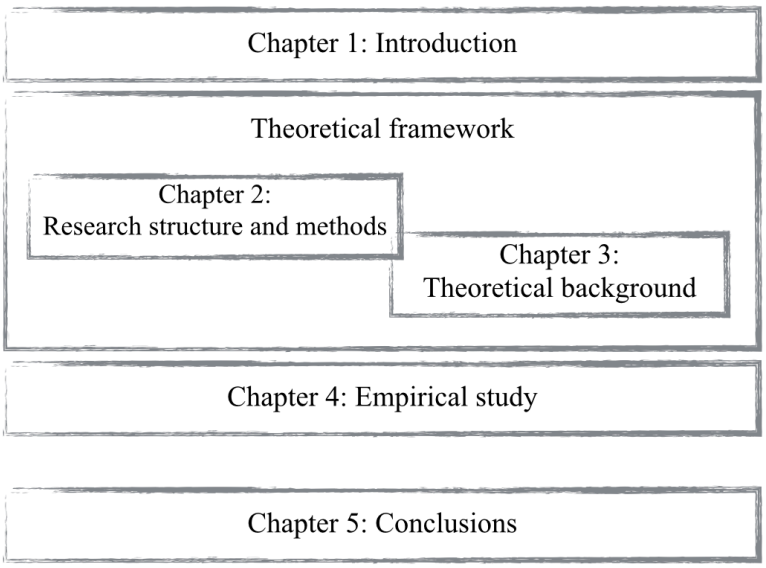


Figure 3. Master thesis structure.

As shown, Chapter 1 functions as introduction to the topic and it discusses the background, problems and objective, it also gives a perspective on air cargo industry. Chapter 2 discusses research structure and methods used for this paper. Chapter 3 is split into four sections that define such concepts as air cargo supply chain, IATA e-freight and risk management, all together they represent a theoretical background for this study. All listed sections aim to familiarize reader with a sequence of theories leading to risk management model for IATA e-freight represented in the last section of theoretical background. Chapter 4 signifies how earlier developed model can be used to support risks identification process in the real air cargo industry. And finally, Chapter 5 summarizes and discusses key results of the paper as well as limitations; it also gives suggestion for a further research.

2. RESEARCH STRUCTURE AND METHODS

The purpose of any research is to collect data that can be processed into information for use by company management in decision-making (Wiid and Diggines, 2009). Research can be defined as a process of gaining new knowledge or its systematic increase. Mory and Redman (1933) define research as a schematic process of gaining new knowledge. And Kothari (2004) describes research in common parlance as referred to a search for knowledge. At the same time research methodology displays the approach and technique of the research and describes the way research is conducted (Kumar, 2008). In other words, research methodology explains the choice of the particular tool instead of another one that ensures the research results and their evaluation.

This Chapter portrays the general approaches and methods for managerial research discussed in literature. Figure 4 summarises the chosen structure of this section.

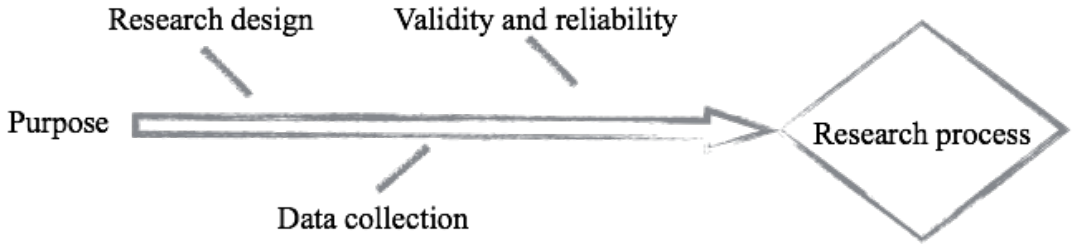


Figure 4. Third chapter structure.

The purpose of research plays a ground breaking role in building a research process carcass. It is logically followed by involvement of research design, data collection methods, validity and reliability of the study. Therefore, research process choice is based on the most suitable methods that can be successfully applied to the real life case.

2.1 Research purpose

Good research is systematic at the point of how it is planned, organised and has a specific goal (Goddard and Melville, 2007). According to Khan (2008), the aim of the research is "…to seek answers to problems through the application of scientific methodology, which guarantees that the information is reliable and unbiased". And, as a result of a good research, final report is logical and understandable for a decision-maker who can quickly get a summary of the current scenario and derive the main points.

As aimed, the purpose of this thesis is in seeking answers to the stated problem that are based on the theoretical carcass. Verification of theories is testing new theoretical hypotheses by use of empirical data (Lunenburg, 2011). In particular, the purpose of this thesis can be detailed as serving a combination of existing theories and practices to create a model that might help in solving real-time business issues in the specific air cargo industry. Furthermore, empirical study conducted within this study is concentrated on analysis of the current business situations, choice of the most applicable theories and the following assessment for the verification of the proposed model.

Besides the purpose, the importance of this study is highlighted with the drastic amount of concerns from the stakeholders' side in air cargo supply chain who express their solicitude regarding the e-freight implementation. In fact, high complexity of the air cargo supply chain stipulates communication problems even nowadays due to the great dependencies between stakeholders, and, as later will be discussed, industry wide initiative makes all processes even more sophisticated. Understanding all dependencies, physical and communication flows between stakeholders are seen as an opportunity to provide an insight on risk management practices that can be successfully utilized for the industry wide project as a whole. Seeing that e-freight implementation accounts for the questions from all parties involved, importance of this study is essential. Finally, the outcomes of this study supposed to provide air cargo supply chain members with a useful approach to identify, assess and cope with associated risks.

2.2 Research design

The main function of a research design is to explain how to find answers for the stated research questions (Kumar, 2011). There are different ways to categorize research approaches. Encyclopedia of Research Design (2010) defines two broad categories: observational and interventional. The main difference between these approaches is in a way to answer research questions. If focusing on managerial practices, literature discusses the following research types:

- Qualitative and quantitative
- Theoretical and empirical
- Deductive and inductive

Business and management research has many different traditions, one of the most fundamental of which is the distinction between quantitative and qualitative research (Bryman and Bell, 2003). Gummesson (1993) claims that qualitative methods aim at improved understanding of the topic and focus mostly on gathering data through interviews, observations and analysis. On contrary, quantitative approach follows strong academic traditions; it focuses on numerical data that represents concepts and opinions in form of numbers analyzed using statistical methods (Amaratunga et al., 2002). In

general, qualitative methods are used far less explicitly when compared to quantitative methods (Goertz and Mahoney, 2012). The most popular qualitative and quantitative methods are:

- Qualitative
    - Case study
    - Action research
- Quantitative
    - Experiment
    - Survey
    - Historical data

Going further, Simon et al. (1994) discuss research as theoretical or empirical. Theoretical research is that related to some abstract ideas or theory. On the other hand, empirical research relies on gathering empirical data - experience or observation alone, often without due regard for system and theory (Kothari, 2004). This data-based research usually followed by analysis and reporting of results and conclusions (Minor et al., 1994). Khan (2008) proposes the following eight steps of empirical research:

1. Statement of the problem
2. Review of concepts and theories and presentation of observation with a reference of previous study
3. Formulation of hypothesis
4. Design the course and methods of research
5. Data collections
6. Data analysis and testing hypothesis
7. Interpretation of data and reaching to generalisation
8. And conclusion
9. Preparation of report and its submission

Finally, research can be classified as deductive or inductive, where deductive is stated for research that proceeds from more broad to more specific theories, and inductive is in opposite direction. Both deductive and inductive logic may be viewed as part of never-ending continuum that begins with theory, which encourages creation of hypotheses, and which in turn calls for observations (Dantzker and Hunter, 2012). Having discussed research design principles, next section will elaborate theoretical perspectives on data collection methods.

2.3 Data collection

There are several data collecting methods exist and widely discussed in literature to underline importance and relevance of data collecting methods. The crucial point is to

choose a right data collection method that would perfectly suit to the research purpose and answer research questions. Such factors as quality, quantity, adequacy and appropriateness of the data collected determine the quality of research (Pawar, 2004). Therefore, decision on a right data collection method or their combination requires a deep understanding from the researcher's side in order to get accurate results.

The data collected at first hand in response to a specific problem by direct observation or measurement is known as primary data (surveys, experiments and observational methods). As an alternative to "first hand" data is data collected by someone else called secondary data. A company looking for data for a specific study will have access to internal sources of secondary data, but there is also a large number of other sources: government statistical publications, company reports, academic and industry publications (Buglear, 2005). In some cases, field diaries, audio and video equipment can be used as data collecting aids (Pawar, 2004). Another perspective on data collection methods is discussed by Gummesson (1993), where five methods of data generation presented:

- Use of existing materials
- Qualitative interviews
- Questionnaire surveys
- Observations
- Action science

Decision on choosing one or another is strongly dependent on the certain business need. Use of existing materials implies on documentation, print publications, videos, statistics, charts and other existing materials that can be accessed. Conducting qualitative interviews according to Gummesson (1999) is the most commonly used method. Interviews are usually open-ended and allow researcher to ask questions that address particular research needs. In undertaking data collection through a questionnaire survey, questionnaire is one of the most crucial elements (Brace, 2013). Gummesson (1999) highlights that this method can be used to evaluate experiences, opinions, attitudes and preferences of chosen group of people, however, poor designed questionnaire can result in a low quality data or data that is biased. Next method is observations, this method involves collecting data by observing recognizable occurrences. Pawar (2004) gives the following categorizations for observation types: structured, unstructured, participant and non-participant. The last method discussed by Gummesson (1999) is action science (or action research). Despite the fact that scientific research looks for rather general explanations that can be applied broadly to different contexts, action research focuses on specific situations and localized solutions (Stringer, 2007). Coghlan and Brannick (2014) specify action research as a family of related approaches that combine theory and action with a purpose to address important either organizational, community or other social issues jointly with those who experience them. In other words, the action researcher can

be a person who actively involved in business processes or participate as an external consultant, a consumer or a citizen (Gummesson, 2001). In addition, Craig (2009) considers action research as a field-intensive process, where researcher takes an active part in the environment being studied, and expected to be participant observer as well as a researcher-as-instrument.

Summing up previously discussed data gathering methods, it is important to note that there is a great portion of overlaps between them. Business realities dictate the rules where data access becomes more and more sophisticated. Therefore, finding the most appropriate mix of data gathering techniques for a particular context can greatly contribute to the research success. To ensure the right choice of data collection tactic, excessive attention should be paid to reliability and validity concepts that will be discussed shortly in section 2.4.

2.4 Reliability and validity

Concepts of validity and reliability in research are widely debated in scientific literature. And, can be successfully applied when it is needed to characterize both types of research - qualitative or quantitative (Golafshani, 2003). In general, validity and reliability concepts are aimed to ask a researcher whether the study addresses the need of this study, and whether the measures are consistent.

Reliability is the degree to which experimentation, test, or any other measuring procedure produces the same result when it is under repeated trials. Noticeably, without the research results, tools and procedures replicability, it is unable to satisfactorily draw conclusions and to make necessary claims. For researchers there are four types of reliability: equivalency, stability, internal and interrater. (Howell et al., 2012).

Validity, according to Hammersley (1990) is referred to the measure of test's or experiment's ability to measure phenomena it claims to measure. Also, validity is affected by researcher's perception of validity in the study and actual choice of paradigm assumption (Creswell and Miller, 2000). As for reliability, validity can be split into two types: internal and external validities (Ihantola and Kihn, 2011). This classification is not the only existing, on contrary, different authors developed their own concepts and classifications of validity, made possible to differentiate validity according to their particular studies' context.

2.5 Research strategy and processes

This master thesis is fully based on a study that was conducted within the Finish air cargo industry. The idea and the actuality of the topic were highlighted while author's Internship at Lufthansa Cargo, Finland. The goal was stated as to investigate risks and

apply risk management practices to e-freight implementation process. Figure 5 presents the chosen research strategy that was suggested as the most appropriate in terms of research design and data collection methods.

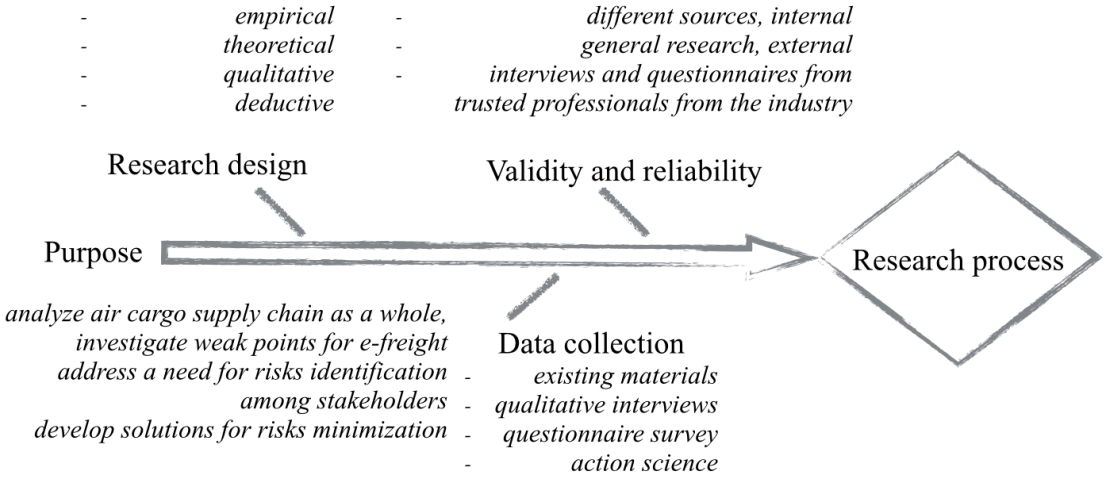


Figure 5. Research strategy.

As Figure 5 depicts, the study aimed to analyse air cargo supply chain as an entity to investigate weak points of the process of e-freight project implementation. Having stated the supply chain complexity (number of stakeholders, information flows, material flows, documentation flows, etc.), addressing a need for risks identification has become a priority for the research conducting. Developing solutions for risks minimization for the parties involved in this business aimed to decrease losses from the risks consequences and probable secondary consequences. Importance of the study emphasized by the e-freight implementation caused concerns among the supply chain members and a need to analyze the current state of industry readiness towards paperless changes.

A mix of empirical, theoretical, qualitative and deductive made possible to design a study. First of all, study is empirical because it is based on gathering empirical data and documenting the results into report form. After stating the main problem, reviewing the concepts and theories was done to develop a model that can be successfully applied to the real air cargo industry facing paperless future. Gathering data mostly from the interviews, questionnaires, observations and researcher's active participation, has lead to the qualitative research orientation. And finally, deductive approach was chosen as the most appropriate due to the vision that getting a big picture let study investigate the common patterns of risks, which later can be successfully utilized by different stakeholders.

A mix of data gathering methods such as existing materials use, qualitative interviews, questionnaire survey and action science believed to result in getting the most accurate and time relevant results. As existing materials were used resources from the internet, latest publications regarding e-freight from IATA and documentation. Qualitative inter-

views were conducted with the representatives of air cargo supply chain stakeholders such as airlines and GHA, lasting 30-45 minutes long. Questionnaire survey was initiated to get a broader picture from stakeholders such as destination and origin forwarders, and airline. The list of people interviewed and accessed by questionnaires as well as the list of interview questions and questionnaire content are shown in Appendix. All results were recorded and analysed to be applicable for a research purpose.

And finally, validity of this study is supported by the author's use of different resources both internal and external. Results of this study can be applied to other national air cargo industries where e-freight implementation at the beginning phase as in Finland. At the same time, reliability of this study is ensured by the commitment of trusted, management-level industry professionals.

As a summary, Figure 6 presents the actual research process developed by the author. The whole process starting from the employment at Lufthansa Cargo, Finland till the survey completion took around eleven months.

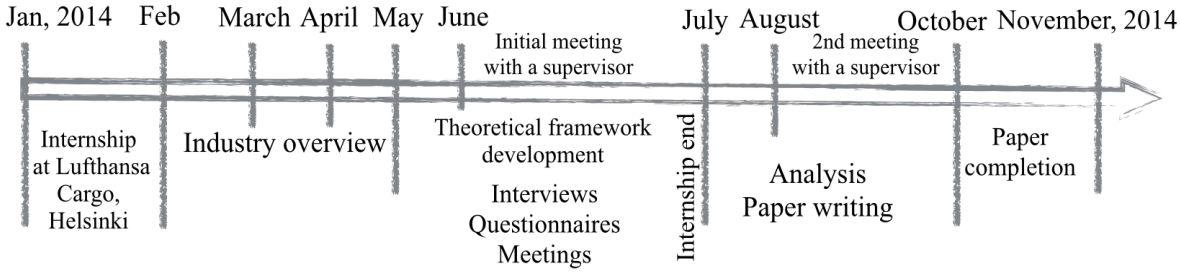


Figure 6. Basic timeline of the research process.

As shown in Figure 6, the research process has been actually started from the moment of entering Lufthansa Cargo company for the position of Intern at Handling, Sales and Marketing Department. To develop an idea of the chosen topic, it took around five months to be integrated into all processes that surround e-freight implementation. Therefore, meeting with a supervisor had place only on 4ht of June, when author got the overview of air cargo industry and was able to get connections for a future research. After the topic, content and logic of the paper discussion, author started her intensive month of doing interviews, meeting industry professionals and sending questionnaires. Right after Internship end on 11.07.2014, analysis and paper writing have been started accordingly. During the writing period, some changes were made in the content of the paper better to adapt it to the objective of the study. Therefore, a conceptual model of this paper is shown in the next Figure 7.

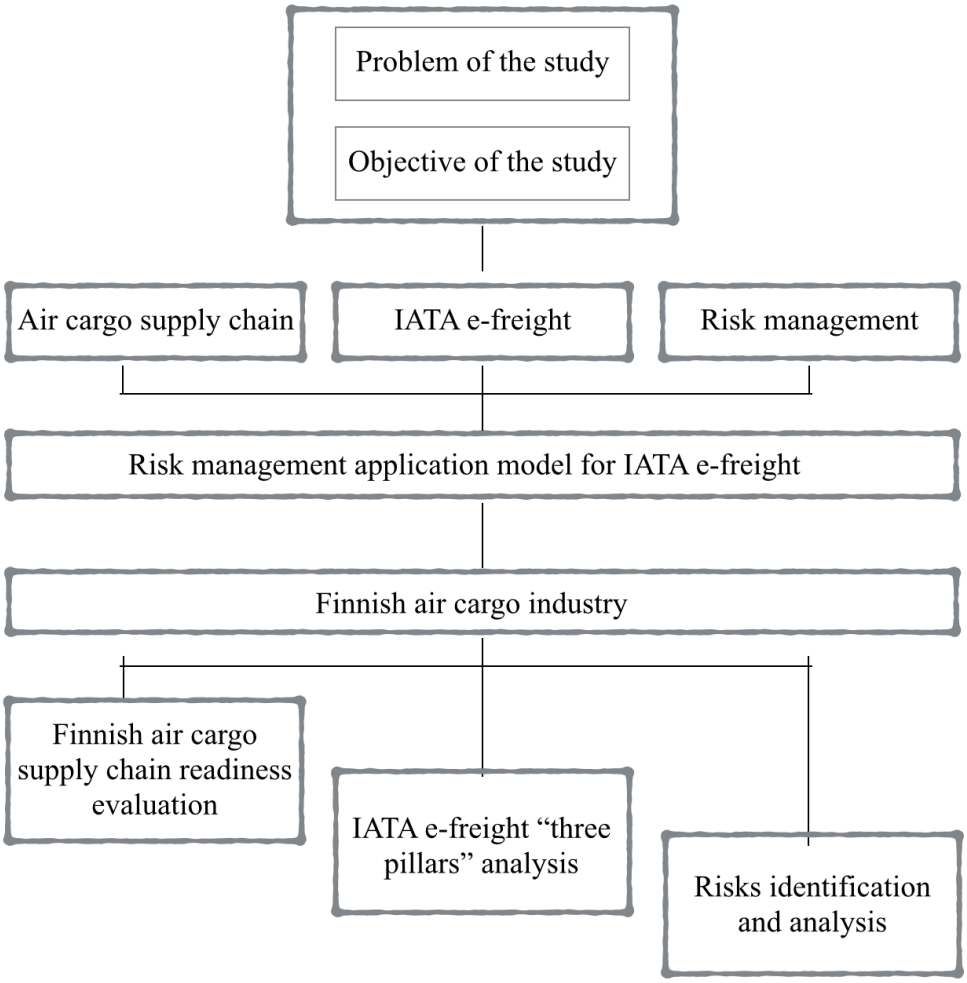


Figure 7. Conceptual structure of this paper.

Conceptual structure summarizes all building blocks of this paper to show the way it was constructed by the author. Next chapters will follow this model and portray the findings.

3. LITERATURE REVIEW

Chapter 3 represents the theoretical background for the chosen study. Based on the wide spectrum of the relevant literature sources, main concepts are outlined, elucidated and interlinked accordingly. This chapter is organized in a logical consequence and split into four sections where separately discussed concepts finally accumulated into a single framework (Figure 8).

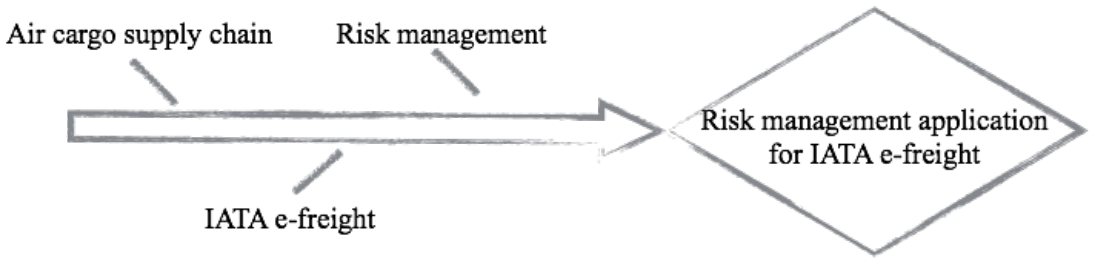


Figure 8. Ordinal analysis of concepts in Chapter 3.

As it can be seen from the visual representation, all discussed concepts in this chapter are displayed in the given order to show a flow of theoretical inputs. Finally, developed framework interlinks all the discussed concepts and provides a valid theoretical basis for the following empirical study.

3.1 Air cargo supply chain

Uptight competitive situations in the modern global markets as well constantly increasing expectations of customers provoke companies to be highly aware of their supply chains. Air cargo industry is not an exception and, indeed, it is a key element in today's speed driven global economy, accounting around 35% of the value of all goods exchanged in a worldwide scale against its actual 1 or 2% of the tonnage (AEA, 2012).

The first section of this chapter introduces the concept of air cargo supply chain and its specifics. Next section examines the parties involved in the supply chain and gives clarifications regarding their main roles and responsibilities. Finally, cargo main types and routes as well as supply chain documents are discussed.

3.1.1 Supply chain, networks and logistics

Traditional comprehensions of supply chain and supply networks as concepts can be considered as a foundation for the variety of industries where they can be applied. New technologies, techniques and strategies evolve constantly to manage the supply chains properly and to allow companies to lower costs.

Supply chain is a chain that encompasses all activities related to fulfilling customer demands and wants (Ling, 2007). These activities are generally associated with the flow and transformation of goods from the raw materials stage through to the end user, as well as the associated informational and funds flows. From this perspective, different customers' businesses dictate diverse variety of demands and wants and the ways of their fulfillment. More outdated supply chain concept definition in APICS Dictionary (1995) explains it as (1) a set of processes from the initial raw materials to the ultimate consumption of the finished product linking across supplier-user companies, (2) the functions inside and outside a company that enable the value chain to make products and provide relevant services to the end-customers. Figure 9 summarizes the traditional perspective on supply chains.

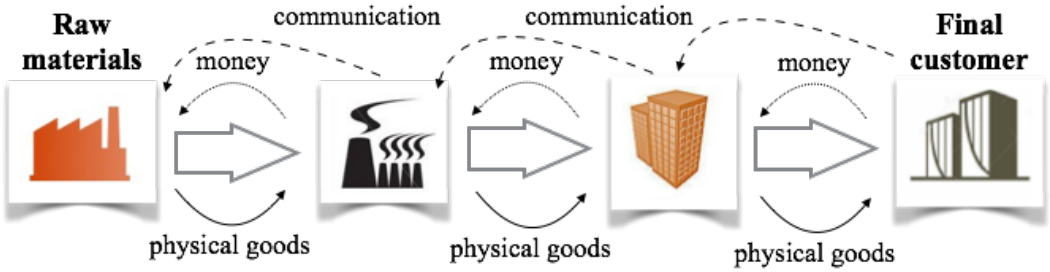


Figure 9. Supply chain (adapted from Fredendall, 2011).

Simple linear "chain" structure is more a theoretical perspective of the concept. So, Journal of Business Logistics (2001) identifies three levels of supply chain complexity:

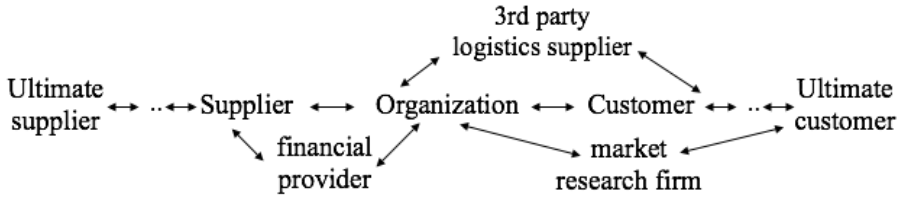
- Direct supply chain (includes a company, supplier and a customer and all involved in the upstream or/and downstream flows of products);

  Supplier ⟷ Organization ⟷ Customer

- An extended supply chain (includes supplier of the immediate supplier and customers of the immediate customer where all parties involved in the upstream or/and downstream flows);

  Supplier's supplier ⟷ .. ⟷ Supplier ⟷ Organization ⟷ Customer ⟷ .. ⟷ Customer's customer

- An ultimate supply chain (all organizations taking part of upstream or/and downstream flows of products and services, finances and information).



In practice, it is quite often that supply chains are complex and can be called as supply networks. Simchi-Levi et al. (2004) is referring supply chain to the logistics networks (Figure 10).

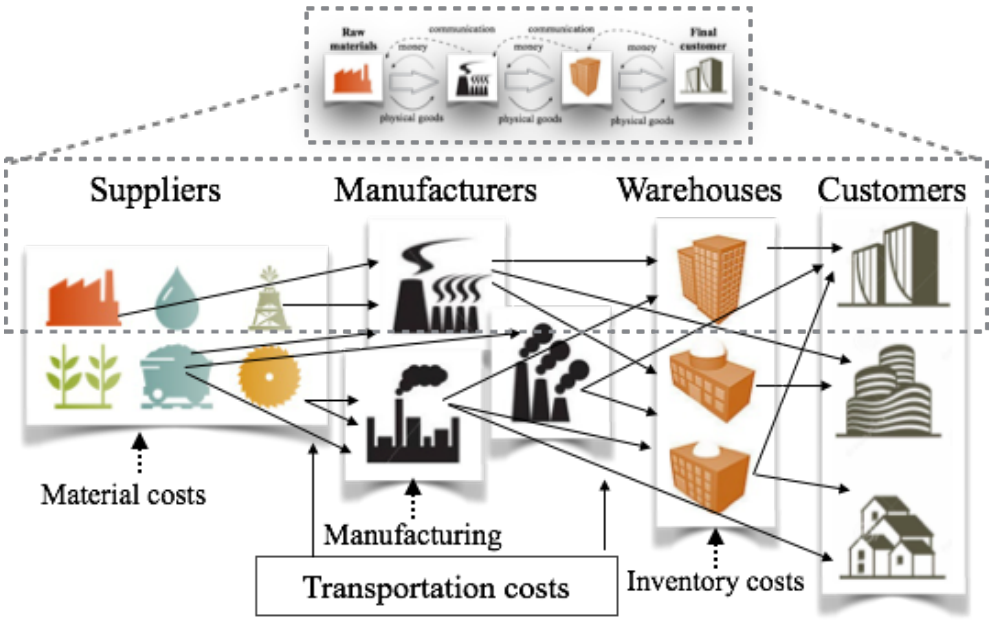


Figure 10. The logistics network (adapted from Simchi-Levi et al., 2004).

It consists of suppliers, manufacturing centers, warehouses, distribution centers and outlets; raw materials as well as work-in-process inventory and finished goods flow between facilities and also reflected in a chain. Network in this case defined as a composite structure with organizations that are cross-linked and have two-ways exchanges between (Harland et al., 2001). Among with the physical goods flows in complex logistics networks, communication and money streams are important components. With the growing complexity of networks, informational and financial flows become more puzzled and multipart accordingly.

Having said that supply chains are referred to the logistics networks, clarification of logistics as an entity is needed. Discussions and different perspectives exist regarding the placement of logistics in the traditional perspective on supply chains. Rushton et al. (2010) provides one of the most widely respected definition that helps to describe the relationship between the terms used in business areas:

Supply chain = Suppliers + Logistics + Customers
Logistics = Materials Management + Distribution

Logistics as a concept has definitely evolved over the years and nowadays includes more activities in firms (Cavinato, 2000). To clarify the borders or the perspectives on logistics concept, Table 1 presents the denotations listed in a chronological order.

Table 1. Definitions of logistics.

Source	**Definition**
Hesket et al. (1973)	"Logistics is… the management of all activities which facilitate movement and the co-ordination of supply and demand in the creation of time and place utility."
Williamson (1990)	"Logistics is… the managerial responsibility to design and administer a system to control the flow and strategic storage of materials, parts, and finished inventory to the maximum benefit of the enterprise."
Tilanus (1997)	"Logistics is the process of anticipating customer needs and wants; acquiring the capital, materials, people, technologies, and information necessary to meet those needs and wants; optimizing the goods- or service-producing network to fulfill customer requests; and utilizing the network to fulfill customer requests in a timely way."
Kasilingam (1998)	"Logistics represents a collection of activities that ensures the availability of the right products in the right quality to the right customers at the right time."
Johnson & Wood (1999)	"Logistics describes the entire process of materials and products moving into, through, and out of firm."
Stevenson (2008)	"Logistics is the part of a supply chain involved with the forward and reverse flows of goods, services, cash and information."
Chartered Institute of Logistics and Transport (UK), 2012	"Logistics is… the positioning of resource at the right time, in the right place, at the right cost, at the right quality."

Based on the given perspectives, it becomes possible to identify how previously discussed concepts are interlinked. Figure 11 poses the final representation.

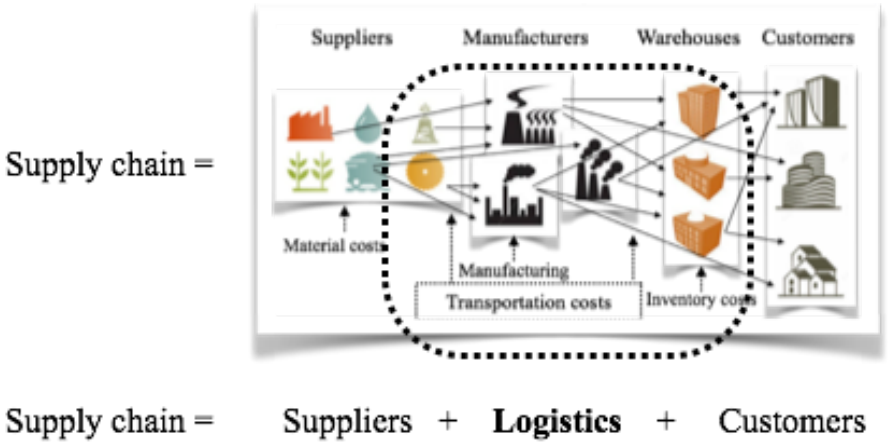


Figure 11. Interrelation between supply chain and logistics

As it will be seen further in thesis, concepts of supply chains and the caused complexity in networks are the factors through which industries can be shaped. Next subsection will discuss the air cargo sector.

3.1.2 Air logistics

Among with the variety of manufacturing industries, transportation nowadays is one of the biggest industries. Transportation is also referred to freight transport that poses a physical movement of goods, inbound and outbound including the actual collection of products and their delivery to the end user (Rushton and Walker, 2007). Air, sea, road and rail are the examples of modes possible for transportation accomplishment.

Early in the course of airline industry's development, the spare hold space on passenger flights was used to carry freight as well as mail (Manners-Bell, 2014). Historically, the first air cargo or airmail flight is a highly controversial topic. First cargo was carried from Dayton to Columbus, Ohio, in November 1910 whereas mail have been carried first from Albany to New York earlier in May at the same year (Wensveen, 2012). But in comparison to that, the first flight carrying cargo (a sheep, cockerel and a duck) by a hot air balloon had place much earlier. With the constant and rapid improvements in technologies, more goods have been produced at that time and freight volumes increased accordingly. Therefore, aircrafts became bigger, popular and more efficient. From year to year it caused supply chains to evolve in a way to become separately positioned as air cargo supply chains.

Nowadays air cargo is a primary part of many manufacturers' and retailers' global supply chains that let companies from a variety of sectors to operate in lean inventory environments (Manners-Bell, 2014). In particular, the air cargo supply chain (Figure 12) is a combination of interlinked parties, locations, data, information and knowledge ex-

changes that makes possible cargo moving from the origin to its destination by air (ICAO, 2013).

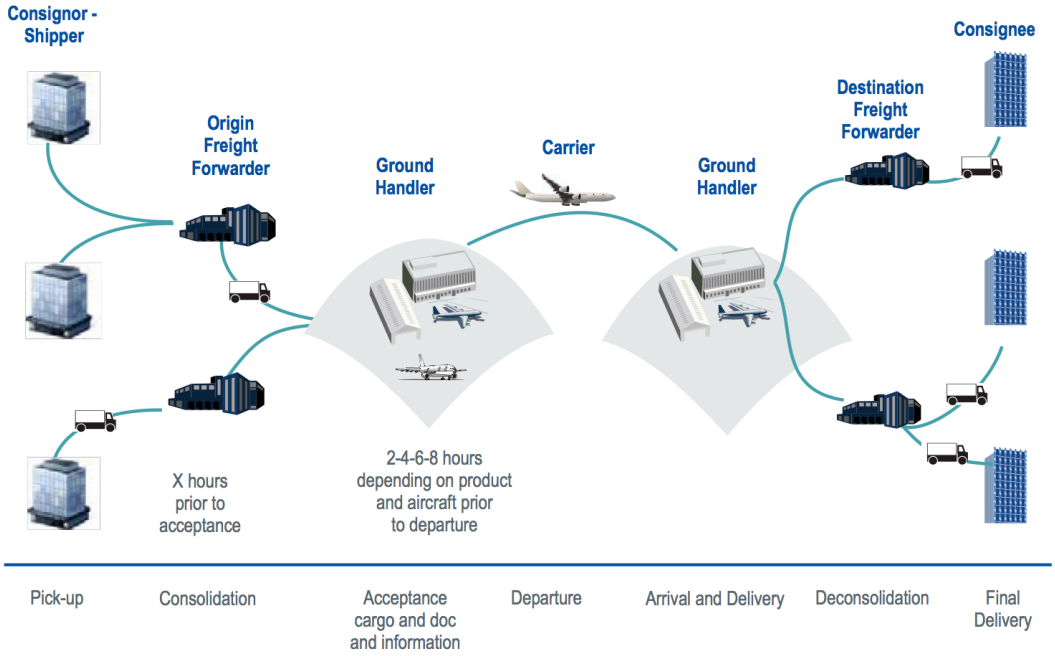


Figure 12. Air cargo movement overview (ICAO, 2013).

It is highly important that all parties share the responsibility through the chain to guarantee safe and secure move of air cargo commodities. Next subsection will review the main roles and responsibilities of air cargo industry players.

3.1.3 Key industry players

As in any supply chain, it is principal to understand how parties are connected and what kind of communication channels are between. Traditionally, the initiative in air cargo supply chains comes from two parties involved - a seller and a buyer who aim to exchange goods by air transport. Taking into consideration the specifics of the industry, seller more commonly known as ‘shipper’ and buyer stands for ‘importer’. On top of that, many terms are used interchangeably and the term ‘shipper’ is equivalent to the term ‘consignor’ as ‘importer’ means the same as ‘consignee’. All other denominations used in an industry mainly remain the same as in a list of key supply chain stakeholders:

- Consignors/shippers
- Origin and destination freight forwarders
- Export and import customs
- Ground handling agents (GHA)
- Origin and destination airlines
- Customs agents/brokers
- Consignees/importers

- Other stakeholders

Consignors/shippers
This terminology is used for an entity or individual who originates the movement of the goods and also known as a 'sender'. However, the terminology of 'shipper' is employed to designate the entity or just individual who initiates the trade in the goods. Basically, these roles are different but in practice they often can be one and the same party performing the actual task (ICAO, 2013). According to Amaruchkul et al. (2007) shippers can purchase services from carriers, forwarders, or integrators.

Origin and destination forwarders
Freight forwarders is the part of the transport logistics process in the supply chain and the main duty can be defined as arranging air shipments to be managed in a way that will allow shipments to be transported by the carrier/aircraft operator. In particular, forwarding agent, or freight forwarder, is a third-party logistics provider who arranges transport movements, documentation handling and other relevant duties on behalf of a shipper (Sandler, 2007). Business Dictionary (2012) defines freight forwarders as entities providing a full range of services including warehousing, export and import documents preparation, booking of air cargo space, freight charges discussions, full spectrum of air cargo insurance and freight consolidation. Also, forwarder may act as the clearing agent for the customs release of goods (IATA Handbook V.4.0, 2013).

A forwarder quite seldom acts as a carrier of the goods, more often it provides services that contribute to the building of a supply chain such as working with multiple carriages in numerous transport modes. Multimodal transports occur when air cargo services are combined with sea, rail, or pre-carriage trucking from the shipper to the departing air

Export and import customs
IATA defines export and import customs as the government service that is responsible for the administration of customs law and the collection of duties and taxes, also it has the responsibility for the application of other laws and regulations relating to the importation, exportation, movement or storage of goods (IATA Glossary, 2012). From country to country customs' business processes differ significantly, but more often technologies employed by customs allow exchanging electronic documents instead of paper versions.

Ground handling agents (GHA)
The GHA is authorized to act for or on behalf of the carrier airline for the process of acceptance, handling, loading or unloading, transit operations and others (IATA Handbook V.4.0, 2013). Usually, this happens when the freight forwarder cannot offer the needed facilities for the required operations with the cargo. At the moment when a shipment is ready for carriage, the freight forwarder releases the cargo and instructs the

GHA to carry it to the actual carrier operator. In practice, GHAs usually located on airport premises to minimize the time needed for cargo relocation and to optimize the processes in handling. Destination and origin GHAs can be the representatives of the same organization or represent different separate units.

Origin and destination airlines

Airlines provide and operate the aircrafts on which air cargo is carried to their destination. The origin carrier is the partaking airline that performs the first part of a carriage over its possible routes, whereas destination carrier is the airline that performs the residuary activities - delivering consignment to the consignee. Airline acts as the key communication facilitator between the main air supply stakeholders (IATA Handbook V.4.0, 2013). According to Manners-Bell (2014) airlines range from the nationwide passenger-carrying airlines to quite small operators, main types of airlines are as follows:

- Scheduled operators offer capacity for the air cargo mainly in the belly holds of passenger aircrafts. Some also operate the freighters only crafts for the most popular and busy routes. They chiefly work on behalf of freight forwarders, express operators and national post offices.

- Freighter operators do not operate for passenger carrying services, but provide freight-only capacities. They can be flexible to adjust to the certain market needs and make priorities for the key routes and times.

- Integrators offer door-to-door services that include the roles of freight retailers, wholesalers and carriers. The global most known players are DHL, FedEx, TNT and UPS who operate their own fleet. Integrators are also known as air express services and considered as the fastest growing segment of the international air cargo (Wood et al., 2002). On the market integrators compete with freight forwarders and the airlines to increase the volumes of carried freight and maximize profits.

- Passenger charter operators do not play a big role in air cargo market due to the fact that mainly they operate on holiday routes and can provide just small carrying capacities.

Customs agents/brokers

IATA Handbook V.4.0 (2013) defines customs broker as an agent or representative or a professional customs clearing agent who is responsible for dealing directly with customs on behalf of the importer or exporter. The task of customs became progressively challenging due to the growing complications of trade policies because of the proliferation of regional and international trade agreements and the bigger complexity of traders

(Wulf and Sokol, 2004). In turn, customs agents' roles and responsibilities have advanced and became more involved.

Consignees/importers
The consignee is the organization whose name appears on the air waybill or in the shipment records as the party to whom the cargo should be delivered by the airline or its agent (IATA Handbook V.4.0, 2013).

Subsection 3.1.3 revealed roles and responsibilities of the air cargo industry players who participate in moving goods and commodities from one party to another to ensure the delivery to the final destination. Next part will give an insight on what kind of cargo types exist and what routes are applicable in air cargo industry.

3.1.4 Cargo types and routes

The variety of cargo types and routes dictate the tendencies in the whole industry. Dependencies on industry players' capabilities to handle any kind of freight and ability to deliver it to the any requested destination are the first indicators of possibility to gain greater market share. Economical and political factors among with many others constantly change the world scale patterns of goods moved worldwide.

One of the latest research shows that "general" freight considering goods ranging from plants and equipment to cosmetics, represents the biggest part of the air cargo volumes. Figure 13 shows the detailed perspective on air cargo volumes defined by different commodity types.

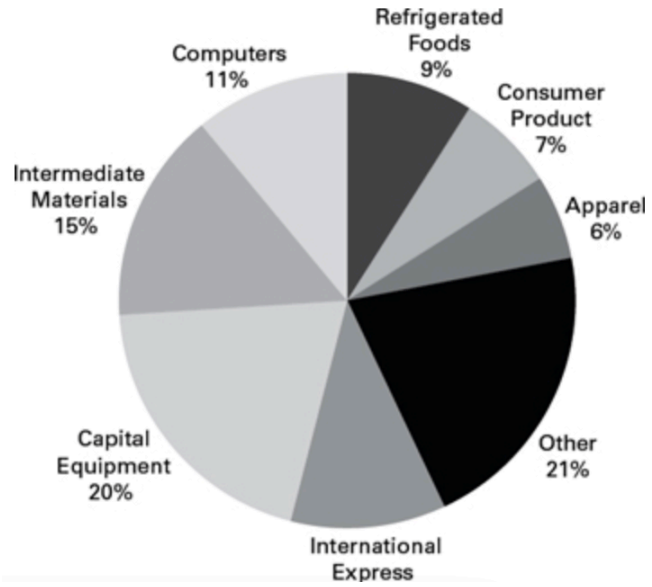


Figure 13. Air cargo volumes by commodity (Manners-Bell, 2014).

According to Wensveen (2012), shipping different commodities by air is the most desirable form of a modern distribution when there are following factors are peculiar:

- Commodity is perishable, subject to quick obsolescence, required on short notice, valuable relative to its weight, highly expensive to store

- Demand is unpredictable, infrequent, seasonal

- Distribution problems include risks of pilferage or breakage, excessive insurance costs for long in-transit periods, special handling requested

Therefore, for commodities that are perishables such as fish and flowers, subject to rapid obsolescence or under the category of other mentioned factors, air transportation turns out to be very advantageous. Going further, for fashion apparel, software and other novelty items timing becomes crucial. For the case of unpredictable demand or seasonal instability, air transport allows respond to the market need without delays and helps to avoid penalties of costly fixed overheads. These examples is just a small part of all commodities that are transported daily between countries and continents.

From the general perspective on cargo types, the following classification can be used as a base: standard, express and special products. Standard stands for the regular, economic transport of the freight; express products are time relevant issues; as specials may be considered dangerous goods (DGR), temperature-sensitive freight, animal transportation, valuable goods and airmail deliveries.

Historical outlook on cargo types and the logistics service providers investigates the strong development of the industry dependencies. Figure 14 portrays the difference shown by air cargo industry players based on the cargo type (documents, parcels, pallets or Less than truck load) transported in 1985 and 2010 years.

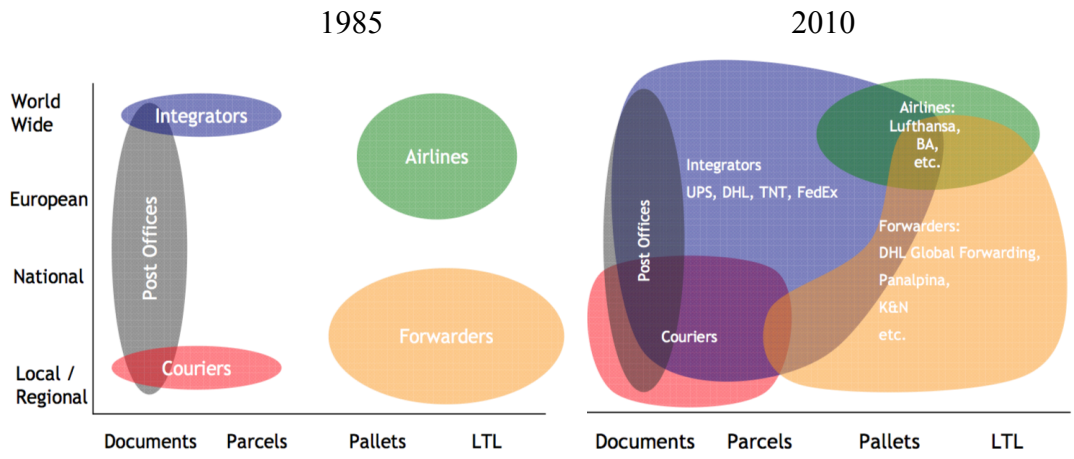


Figure 14. Logistics Service Providers (Steer Davies Gleave, 2010).

According to Manners-Bell (2014), there are twelve largest cargo airlines in the whole world that carry over 86 billion tonne kilometres (RTKs). It composes around 48% of all air cargo. The main routes with the associated volumes transported are shown in Figure 15.

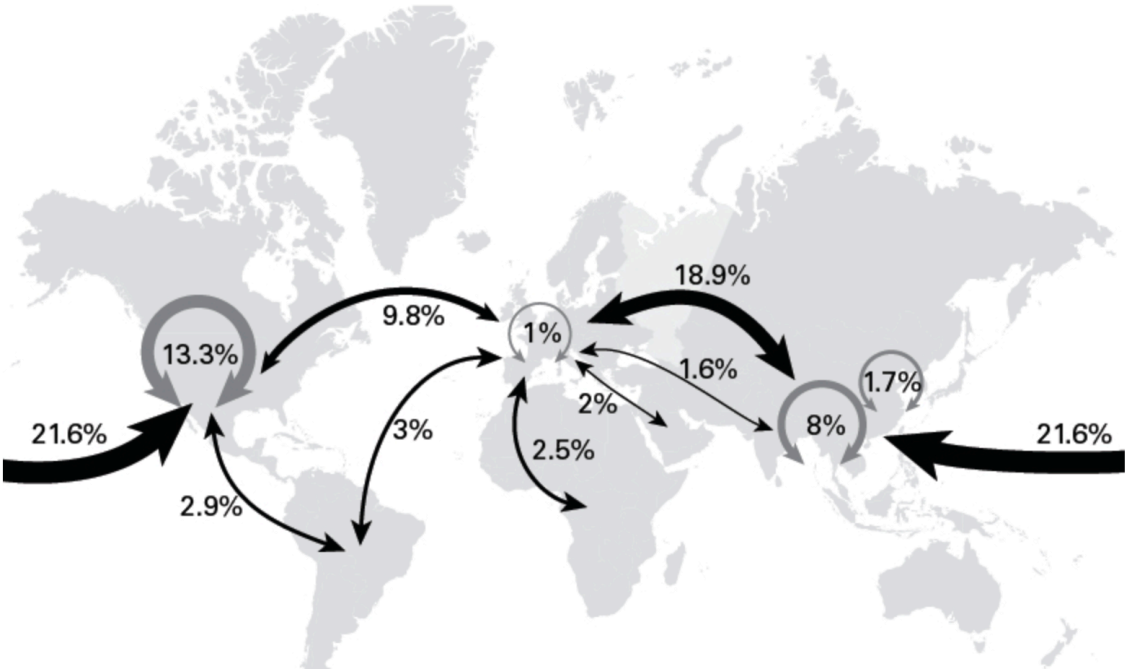


Figure 15. Major air cargo routes by volume.

Subsection 3.1.4 aimed to give a general perspective on the main cargo types and routes. Presented visualizations portrayed the tendencies based on the latest statistical data. Next part will explain the means of documents transported or needed for cargo transportation by air.

3.1.5 Supply chain documents

Air transport process cannot function without the variety of documents that move with the physical cargo or prepared and stocked to allow those movements. More than twenty documents at various phases of airfreight transport process are required (Sales, 2013).

There is no unified form for the scope of documents needed in the worldwide scale. Differences appear in cases of customs national norms, security requirements, trade laws between countries or continents and many other factors. Therefore, amount of documents for the airfreight transportation may vary between thirty and fourteen documents. With the current tendencies in the industry, amount of documents in the flow is the topic of constant change and decrease.

This section will give the short explanation of fourteen documents in general cargo documents flow that has been set by ICAO (2013).

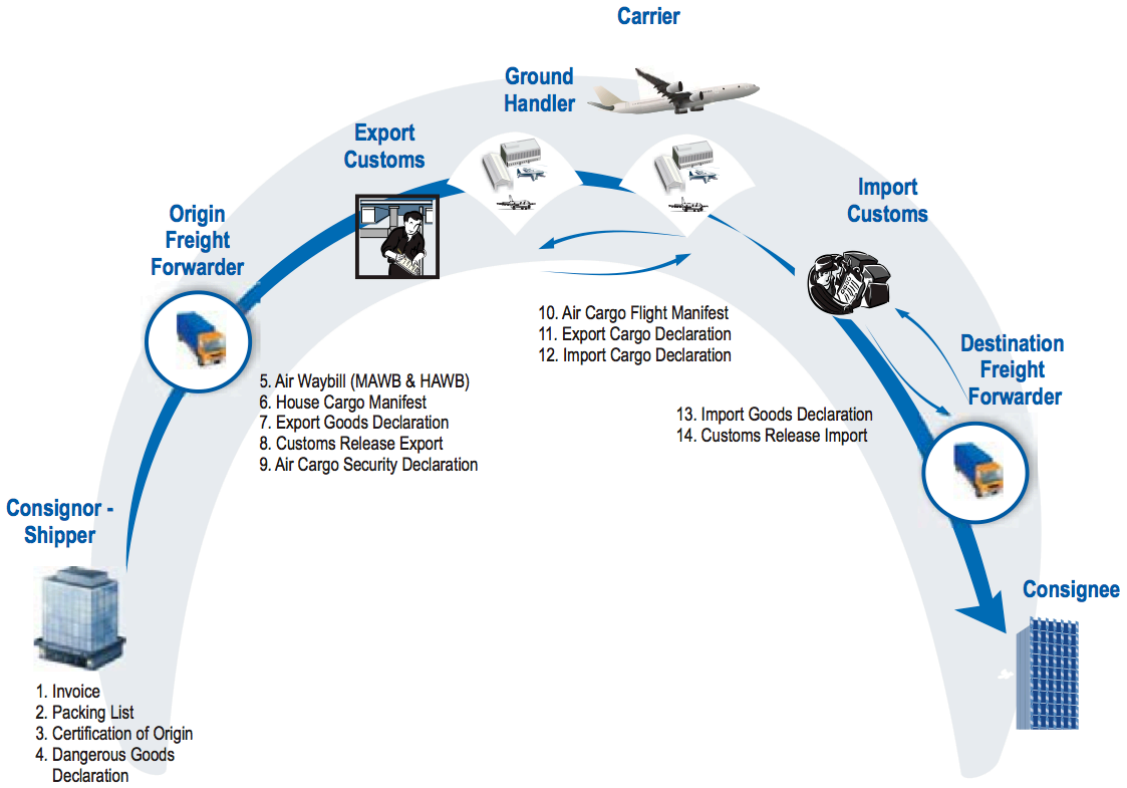


Figure 16. General cargo most common document flow (ICAO, 2013).

1. **Invoice** is a document needed by customs in an importing state to see the invoice or selling price. Document stipulates the costs for freight, packing, insurance cover and terms of delivery.
2. **Packing List** is a document that defines the certain arrangement of goods in individual packages (IATA Handbook V.4.0, 2013).
3. **Certificate of Origin** is a form identifying the goods origin (a specific country, group of countries, part of a country or region). Additionally, declaration by the manufacturer, producer, supplier or exporter may be included.
4. **Dangerous Goods Declaration** is a document that guarantees the dangerous goods have been packed, marked and labeled in accordance with the provisions of the IATA DGR (IATA Handbook V.4.0, 2013).
5. **Air Waybill** is a non-negotiable transport document covering transport of cargo by air from origin airport to destination airport (Hinkelman, 2009). It is issued on behalf of the shipper that evidences the contract between the shipper and carrier for the actual carriage of goods. Two main functions of Air Waybill are contract of carriage and evidence of the receipt of goods (IATA Handbook V.4.0, 2013). At the same time **Master Air Waybills** (MAWB) are issued by or on behalf of freight forwarders offering a consolidation service. In case if

freight forwarder offering consolidation service with the use of its own air waybill to the shipper, **House Air Waybill** (HAWB) is issued. This document will act as a multimodal transport document (ICAO, 2013).

6. **House Cargo Manifest** is a document that contains details of consignments loaded onto a specific flight.
7. **Export Goods Declaration** is a document whereby goods are declared for export Customs clearance.
8. **Customs Release Export** (Customs Delivery Note) is a document whereby a Customs authority releases goods under its control to be placed at the disposal of the party concerned for export (ICAO, 2013).
9. **Air Cargo Security Declaration** provides an audit trail of how, when and by whom cargo has been secured along the supply chain (IATA Website, 2014).
10. **Air Cargo Flight Manifest** is a document that contains the same data about the goods transported as House Manifest, but not in a detailed form.
11. **Export Cargo Declaration** (Freight Declaration) is a document providing the specifics required by customs regarding the cargo carried by commercial means of transport (IATA Handbook V.4.0, 2013).
12. **Import Cargo Declaration** is same as above Export Cargo Declaration, but for the inbound cargo only.
13. **Import Goods Declaration** same as above for Export Goods Declaration, but for inbound cargo only.
14. **Customs Release Import** same as above for Customs Release Export, but for inbound cargo only.

As mentioned in the beginning of this part, amount of documents in a flow for cargo transportation may vary significantly. Fourteen documents listed are paper forms that issued, copied and stored in different amounts for different periods. Taking into account the average number of copies issued for one single shipment, it can be concluded that minimum thirty paper pages are in rotation for one flow. Next section will present the idea of paperless air cargo initiated by IATA that already works for single stations around the world.

3.2 IATA e-freight

E-commerce, e-business, e-solutions, e-systems are examples of self-explaining trends that have been deeply integrated into leading industries since computer technologies progressed. In 2004 International Air Transport Association (IATA) Board mandated the Association to lead an industry-wide project to migrate from paper-based to paper-free-process called e-freight (Air Logistics Journal, 2013). Since that time, the real tools for implementing this project have being constantly developed and computed. The e-freight program is planned to modernize the process, replacing paper with digitized

standard documents revised for electronic commerce; it helps to achieve the goal of cutting 48 hours from end-to end shipment times (IATA Annual report, 2014).

Section 3.2 will present few sections discussing e-freight vision and a Roadmap, will give an insight regarding industry benefits and stakeholders' business value. Information about the actual scope and implementation approach will be given in the last 3.2.4 and 3.2.5 subsections.

3.2.1 E-freight vision and Roadmap

As any industry-wide project, it took many years to define project specifics and take into account all circumstances for all parties involved into it. IATA defines e-freight vision as…

…Building and implementing an end-to-end paperless transportation process for the air cargo industry where paper documents are replaced with the exchange of electronic data.

Air transport probably provides the most comprehensive example of applying e-freight solutions (Pilli-Sihvola et al., 2011). However, program inception and its constant evolution allowed to get a "product" that could respond to the industry needs towards the paperless change. E-freight development life cycle shown in Figure 17 portrays the main activities on a stage of a project formation.

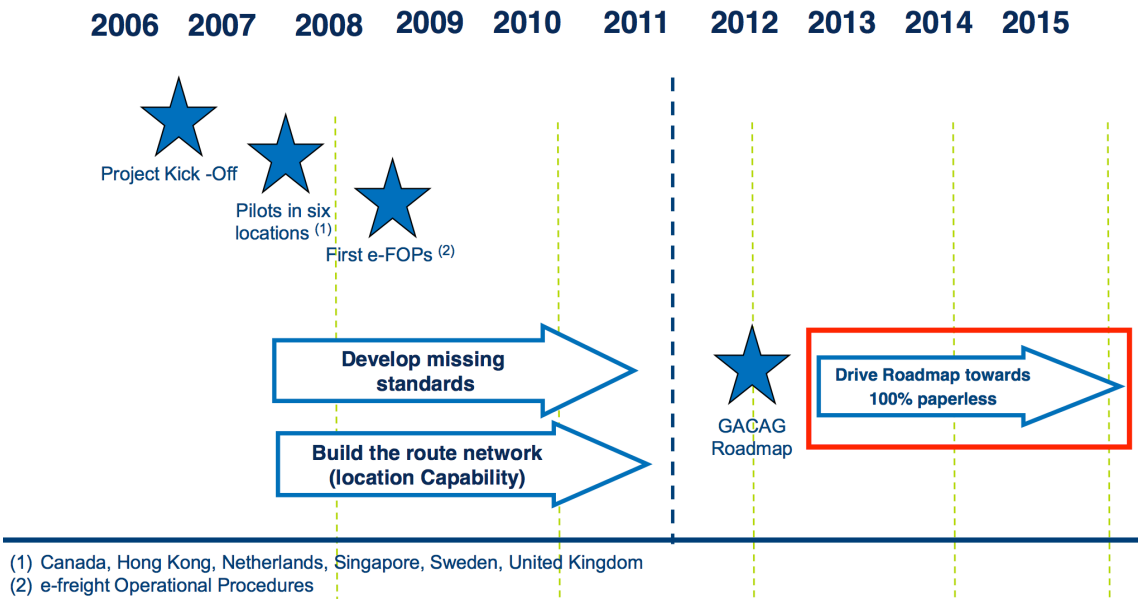


Figure 17. E-freight development life cycle (IATA, 2013).

In 2012, GACAG (Global Air Cargo Advisory Group) has lead the review of the e-freight initiative with the aim to define a cooperative air cargo industry approach for

paperless transportation processes implementation. “Three-pillar” Roadmap was adopted to drive towards the vision. Each of the pillars defines the boundaries of the activities with the clear established goal and set time frames for achieving the results. Figure 18 shows the pillars for main stakeholders involved in air cargo supply chain.

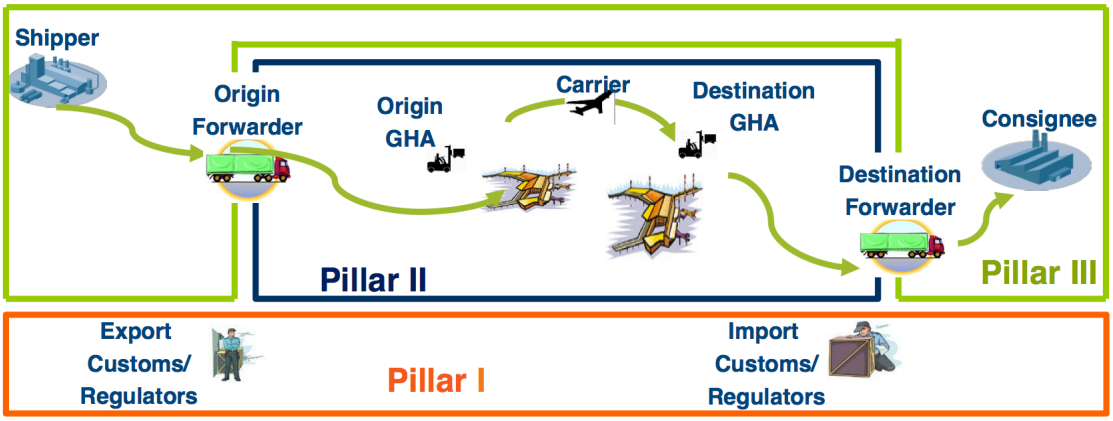


Figure 18. Three Pillars to drive towards the vision (GACAG, 2012).

Pillar I - Establish Route Network:
Engage Customs to create a network that will allow digitalizing twelve core transport documents. Key goal is 80% coverage by 2015.

Pillar II - Allow paperless “airport-to-airport”:
To digitalize such core transport documents as Air Waybill, House Manifest, Consignment Security Declaration and Flight Manifest to allow paperless acceptance and delivery of goods. Key goal is full coverage by 2015.

Pillar III - Allow paperless “door-to-door”:
To digitalize all core commercial documents such as Invoice, Packing List and Special cargo papers and to remove document pouches. Key goal is to define an industry plan.

All three pillars aim to concentrate on the certain parts of the air cargo supply chain that were split into three segments to ease their approach and coordination. To clarify the drivers of the e-freight initiative, next part will evaluate main industry benefits.

3.2.2 Overview of industry benefits

When talking about e-freight and benefits it promises to bring, lean thinking concepts are considered as accompanied elements. In very general, lean thinking can be described as a process of doing more with less - time, capital, space or resources, etc. As Peter Drucker (2003) says:
“There is nothing so useless as doing efficiently that which should not be done at all”.

According to Russel and Taylor (2009) lean thinking enables to draw companies' processes and eliminate waste that is more about paper flows and information processing. It is a way of giving people at all levels of an organization the skills and a collective means of thinking systematically, drive out waste by designing healthier ways of working, improving connections and easing flows within supply chains (Wood, 2004).

Wood (2004) concentrates on seven waste categories mostly applied to the manufacturing environment: unnecessary motion, defects, overproduction, unnecessary inventory, inappropriate processing, transporting and waiting. In air cargo industry, categorisation can look different, but correlation can be outlined. IATA points out seven key criteria:

- Cost savings - reduction of paper transportation costs and document processing
- Speed - time savings with the newly gained opportunity to send shipment documentation prior before the cargo move
- Quality and reliability - allowing one time data entry and excluding shipment delays due to missing documentation
- Visibility - ability of track and trace control for electronic documentation
- Simplicity - globally unified messaging standards for all stakeholders involved
- Regulatory advantage - ability to build upon the existing e-freight processes and standards new e-customs requirements
- Environmental - elimination of more than 7,800 tons of paper documents yearly

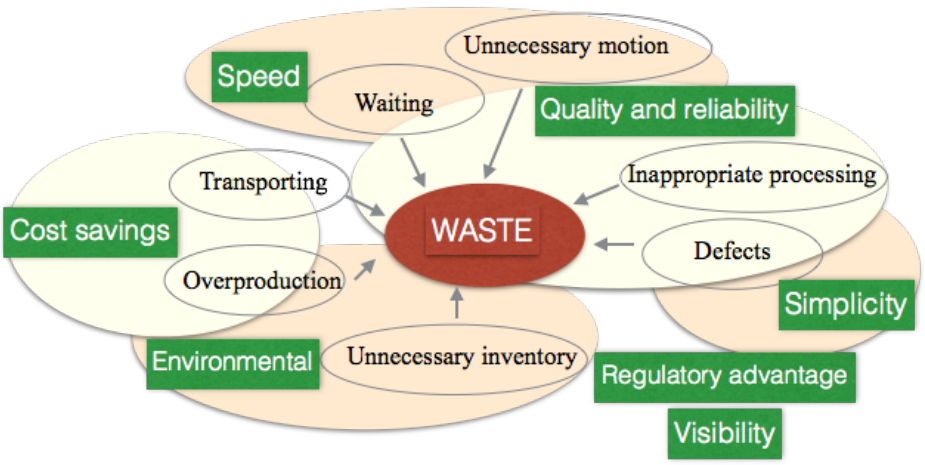


Figure 19. E-freight industry benefits through the seven wastes prism.

Summarizing, in this research Figure 19 presents the idea of e-freight industry benefits categorisation with the seven wastes basis. The overlapping areas show how eliminating different wastes lead to the industry benefits criteria pointed by IATA for e-freight project. Next subsection will concentrate more deeply on business value for different stakeholders involved in the air cargo supply chain.

3.2.3 Stakeholders business value

Having all industry benefits stated, business value for the different stakeholders along the air cargo supply chain might have been evaluated. E-freight asks to integrate commonly new way of business operations - electronic messaging standards for cargo shipments and it reflects in a long process of changing standard practices. What does e-freight promise to bring (Figure 20) to the industry players to cover their expenses? In general, the savings on paper alone would potentially save the airline industry a staggering US $4.9 billion annually and the shipment end-to-end cycle will be reduced to 24 hours (ITP Business Portal, 2011).

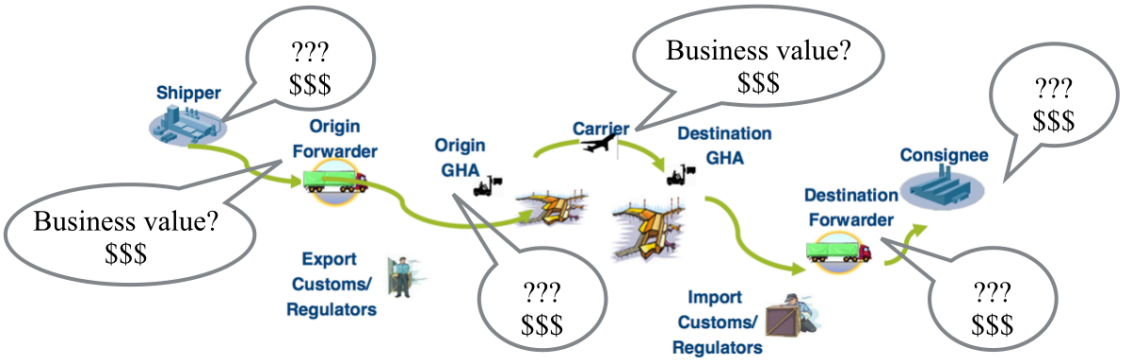


Figure 20. Business value perspective for main stakeholders.

To figure out the value of the key savings, IATA Handbook V4.0 (2013) presents the financial analysis diagram (Table 2). Net benefits illustrated for an eight-year period starting from 2010, amounts in US $ billions .

Table 2. E-freight financial analysis for the business case (IATA Handbook V4.0, 2013).

		YEAR 1	YEAR 2	YEAR 7	YEAR 8	Total
COST SAVINGS						
Document Processing		$ 1.18	$ 1.27	$ 1.66	$ 1.73	$ 11.74
Delivery Time		$ 0.63	$ 0.66	$ 0.83	$ 0.87	$ 5.97
Inventory Savings		$ 1.26	$ 1.32	$ 1.66	$ 1.74	$ 11.91
Reduced Customs Penalties		$ 0.02	$ 0.02	$ 0.02	$ 0.02	$ 0.16
Market share increase over other modes of freight	1.00%	$ 1.16	$ 1.23	$ 1.67	$ 1.78	$ 11.59
Potential Savings Subtotal		$ 4.24	$ 4.50	$ 5.85	$ 6.16	$ 41.38
% international air freight volume e-freight enabled		38%	69%	98%	98%	
Average % penetration in enabled airports (2 year lag on enablement		1%	15%	98%	98%	
Potential Savings Subtotal		**0.02**	**0.47**	**5.62**	**5.91**	**24.00**
EXPENSES						
New technology expenses		$ (0.5)	$ (0.6)	$ (1.3)	$ (1.0)	$ (9.6)
NET BENEFIT (COST)						
Net Benefit		**$ (0.5)**	**$ (0.2)**	**$ 4.3**	**$ 4.9**	$ 14.4
Cumulative Net Benefit		$ (0.5)	$ (0.6)	$ 9.5	$ 14.4	
Savings / transaction		$ (4.41)	$ (1.58)	$ 31.94	$ 35.16	

Results of the presented business case model showed five key savings: document processing, delivery time shortening, inventory savings, customs penalties reductions and increased market share over the modes of freight. Additional note should be said regard-

ing the costs for the e-freight migrating to the industry such as costs for new technologies that might not be ignored.

As a practical example, Case study of Kuehne-Nagel multinational forwarder summarized the e-freight benefits for Hong-Kong station as follows:

- E-freight implementation brings between 8% and 44% manpower savings
- Implementation of e-AWB is a natural first step with cost benefits between 8% and 19%
- Other non-monetary benefits include quality, speed, visibility and simplicity as improved factors

This subsection aimed to give an insight into the benefits that can be expected from e-freight implementation in air cargo industry. Obviously, different stakeholders will have totally different scenarios how e-freight works for them. Moving forward to the e-freight paperless industry, stakeholders might develop unique business models that will carry companies to the benefits.

3.2.4 Implementation approach

To guide all stakeholders among the supply chain to implement e-freight, IATA has developed a methodology to follow. It consists of six steps that logically lead to the e-freight project successful start (Figure 21). This part will give information on implementation steps main features.

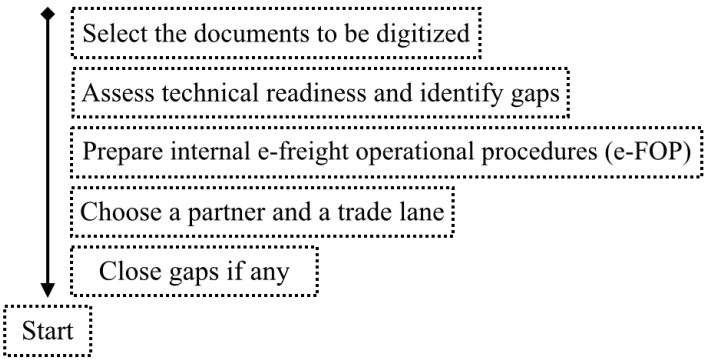


Figure 21. Adopting e-freight.

Select the documents to be digitized. There are three types of documents in air cargo transportation: regulatory related, trade related and commercial. Decisions regarding the starting electronic messaging instead of the previously printed document does not come easy for all of the documents types. Some of the regulatory related documents, for example, need legal frameworks in place. Therefore, it is impossible to disregard local laws allowing the electronic contracts and transactions (IATA Handbook V4.0, 2013).

Assess technical readiness and identify gaps. To do this assessment, IATA provides a self-assessment questionnaire on the website where any stakeholder may proceed with the evaluation. After evaluation, recommendations are given for the identified (if any) gaps. To close those technical gaps, there are different options suggested: to rely on own IT resources or to request help from the third party Technology solutions provider. Additionally, IATA lists the names of current providers where any party can get a technical support.

Prepare internal e-freight operational procedures (e-FOP). IATA states: "E-freight implementation may require changes in your current business process" (IATA Handbook V4.0, 2013). Therefore, writing operational procedures is essential for supporting e-freight in a way of knowing what to do and how to do in order to align new processes with the current business status. Training operational personnel also suggested to be done as soon as e-FOP defined and validated through the dry-run tests. The following list shows the most common changes that might be required in companies' business processes:

- Documents handling
- Exchange of messages and electronic data
- Archiving of documents
- Performing ancillary functions

Choose a partner and a trade lane. After decision to build a technical capability for e-freight, it is time to decide on with which partners and on which trade lanes operating e-freight shipments is possible. IATA provides access to the e-Cargo Matchmaker with a list of all possible e-freight capable airlines and freight forwarders, locations and airports in order to see the real-time status of the point.

Close technical gaps if any. All technical gaps need to be addressed for successful e-freight implementation. There are three ways to do:

- Internal developments base don in-house IT resources
- Outsourcing - IT solution providers and/or IT consultants
- Acquisition of third party IT solutions that is already skilled to support e-freight

Ensuring in readiness for e-freight comes from the full spectrum of technical capabilities and adopted business processes to exchange electronic data with the chosen partners for the chosen trade lanes. Performing wet-run tests is the next step, a method when the real shipments go with the sealed pouch of all printed documents, but in a perfect case it will not be opened at all. If a pouch opened on a way, it is a sign of investigation why it happened and where electronic messaging didn't work properly. Once everything is

ready (e-FOP defined, personnel trained, technical gaps closed and wet-run tests successful), go-live decisions can be made (IATA Handbook V4.0, 2013).

Start. Based on the probable faults during the preparation to go "paperless", shipments should go without any obstacles. With the generating more documents in an electronic form, step by step, shipments should go with less printed documents attached as well as less documents should be generated when it comes through all stakeholders involved.

Section 3.2 aimed to introduce the e-freight project and highlight the main features regarding its implementation. In order to be able to address the thesis objective, theoretical implications concerning risk management practices are in need. Next section will introduce them more specifically.

3.3 Risk management

Projects are seldom realized fully according to plan and even well planned projects may face troubles when reaching their objectives (Artto et al., 2011). Especially in case of industry-wide projects, it is impossible to foresee all the opportunities and ways how projects can be affected by side effects. Therefore, many factors can be missed in the project planning phase and its lifecycle.

Risk is an aspect of organizational life that is reflected in the future outcomes accompanying with investment decisions and resources, products and services, and the management of supply chains (Khan and Zsidisin, 2011). Understanding project risks and the way how they may affect business processes require knowledge and intuition of all the parties involved. The following subsections discuss the risk management practices and processes; show risks classification types and assessment tools that can be applied to the industry-wide project such as e-freight.

3.3.1 Risk management and supply chain risk management

It is impossible to avoid risks in every single situation in a human life. Any organization must strive to find creative ways to be able continuously reinvent its business model and, therefore, to sustain business growth and create value for stakeholders (IMA, 2007). There are plenty definitions of risks depending on the context where it can be applied. Berg (2010) states that risk is referred to the uncertainty that surrounds future events and outcomes; it expresses the likelihood and impact of an event and has a potential to influence the attainment of organizations' objectives. In other words, risk can be defined as a combination of probability (frequency) of occurrence of a defined hazard and magnitude of the occurrence (BS 4778, 1991). With the respect to the objective of this paper, the following definition of a risk will be used as the most appropriate:

"…The potential events or circumstances that threaten the planned execution of the project" (Royer, 2002).

In the context of project management, uncertainty is thoroughly connected to the theory of risk and can be described as imperfect information about the future event or outcomes. This statement does not automatically refer uncertainty to the only negative perception of those future events, nor claims that those events going to be with a positive direction. From a financial side, Walter (2010) explains uncertainty as a state of not knowing whether a proposition is true or false. Therefore, uncertainty simply signals about the circumstances that may include risks. It is impossible to eliminate all project risks without eliminating the project itself (Jordan, 2013).

Risks and uncertainties surround every single side of any business activity. Supply chains is not an exception. From year to year a global competition is constantly escalating and supply chains become more complex and sophisticated. Craighead et al. (2007) claim that nowadays supply chains are vulnerable to disruptions with large unanticipated consequences. Desired performance goals for businesses is under the threat of not to be met due to the risks of supply chain failures. Therefore, it is essential for companies to plan for disruptions and develop contingency plans (Tummala and Schoenherr, 2011). Before talking about the actual plans for possible disruptions, it is important to clarify the borders of the managing practices for risk management (RM) and to place the supply chain risk management (SCRM). Table 3 presents the findings.

Table 3. Concepts of risk management and supply chain risk management.

Risk management	**Supply chain risk management**
"Risk management (RM) refers to managed activity that identifies and evaluates potential project risks, plans and executes responses that will affect the likelihood that risks will occur, and takes steps to mitigate the effects of actual risk occurrences." (Artto et al., 2011)	*"SCRM is the process of risk mitigation achieved through collaboration, coordination and application of risk management tools among the partners, to ensure continuity coupled with long term profitability of the supply chain."* (Faisal et al., 2007)
"RM is an activity which integrates recognition of risk, risk assessment, developing strategies to manage it, and mitigation of risk using managerial resources." (Berg, 2010)	*"Supply chain risk management (SCRM) is the process of systematically identifying, analyzing and dealing with risks to supply chains."* (Waters, 2011)
"RM is the act or practice of dealing with risk…includes planning for risk, assessing	*"SCRM… is a process involved in the reduction of the probability of occurrence*

risk issues, developing risk handling options, monitoring risks to determine how risks have changed." (Conrow, 2003)	*and/or impact the damaging supply chain events have on the firm."* (Zsidisin and Ritchie, 2009)
"RM is the reaction to risk by individuals or businesses as they attempt to ensure that the risks to which they are exposed are the risks to which they think they are exposed and want to be exposed." (Wiley, 2001)	*"SCRM is a concept which contains all strategies and measures, all knowledge, all institutions, all processes and all technologies, which can be used on the technical, personal and organizational level…"* (Kersten and Blecker, 2006)
"RM is the process for systematically identifying, analysing and responding to risks throughout an organization." (Waters, 2011)	*"SCRM is interested in the coordination and collaboration of processes and activities across functions within a network of organizations."* (Olson, 2012)

To summarize the theoretical overview, graphical representation (Figure 22) shows the SCRM placing in the project risk management perspective.

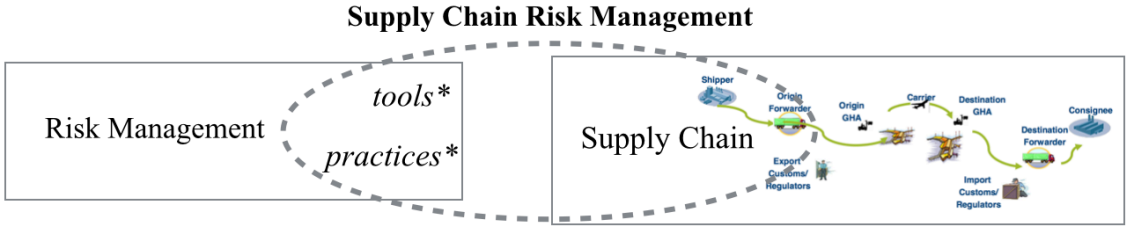


Figure 22. RM and SCRM general interrelation.

Depending on the industry, risk management practices vary significantly due to the difference in business objectives and the organizational strategies. It was discussed how RM is reflected for organizations related to supply chains, but the concepts of SCRM is not limited for the separate players. When talking about industries as a whole, many industry players involved into the highly sophisticated chains, therefore, risk management tools and techniques are applied to manage the processes and to coordinate industry-wide projects. Next section will present the theoretical perspectives on risk management processes that will help to outline the basis for the following empirical study.

3.3.2 Risk management process

As it has been previously stated, risk management tools and practices are highly differentiated according to the context where they need to be applied. Risk management can be applied to all levels of an organization including strategic and operational, also to industry-specific projects, decisions and recognised risk fields. This subsection portrays two views on risk management process - a standard model and an enterprise-wide.

The general risk management process consists of few major steps: risk identification, risk analysis, risk assessment, risk control and coverage, risk monitoring and overview (Cameron and Raman, 2005; Lester, 2014; Conrow, 2003; Tummala and Schoenherr, 2011). Figure 23 presents the basic model starting from the risk identification. Important note is that any risk goes through the whole cycle at least once and quite often several times.

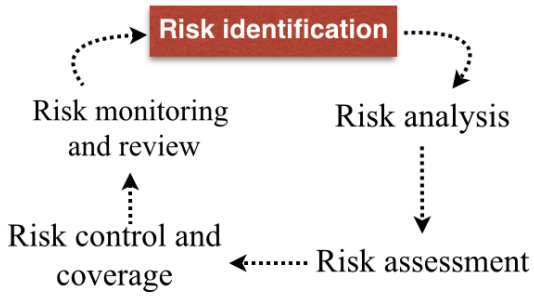


Figure 23. Risk management standard process model (adapted from Conrow, 2003).

Risk identification. The purpose of this step is to identify risk events and their consequences that could prevent the project from meeting its defined goals of scope, schedule, cost, resource consumption and quality (Smith and Merritt, 2002). In other words, it can be summarized as identification of weak points. Once risks are identified, their nature and magnitude can be communicated with different systematic methods over the several stages of a single project (Artto et al., 2011). In particular, this stage includes determining of risk sources related to the stated objectives, identifying casual factors and existing controls. The role of participants of the process of risks identification can play project team, experts from part of the organization, customers, managers, stakeholders, outside experts, etc. In case of highly complicated supply chains, where goods, information and money flows are highly complex, it is crucial to review the whole picture of all possible risks from all the parties affecting or depending on the business. Loosemore et al. (2006) propose the following techniques that might be helpful for risks identification:

- Decomposition techniques
  - The Devil's advocate
  - Scenario building
  - Attribute listing
  - Forced relationships
  - Synectics
- Forecasting
- Soft systems analysis
- Brainstorming
  - The Delphi technique

  - The nominal group technique
- Influence diagrams
- Fault tree analysis
- Simulation

Risk analysis stage is referred to the assessment the likelihood/probability and consequences/impact for each risk. The probability of a risk can be based on organizational historical data, close-out reports from previous projects or similar. The probability rating can be given as high, medium or low. In a similar way, the impact can be ranked as severe, medium or low based on the available statistical data, other projects' histories or experts' opinion. Summarized matrix model be shown as in Figure 24.

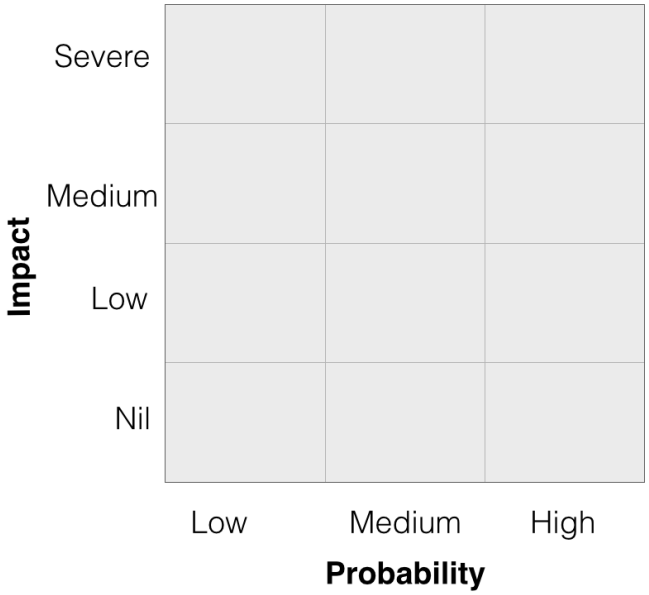


Figure 24. Risk analysis matrix (Lester, 2014).

Developing the valuation techniques are unique for different businesses and cannot be simply unified. Organizations are able and advised to develop or adopt ratings or classifications that best suit their particular business (Critical Infrastructure Group, 2003). Berg (2010) claims that it also involves identification of the controls, an assessment of their effectiveness and the consequential level of risk with controls in place (the protected, residual or controlled risk).

According to Artto et al. (2011), risks can be evaluated qualitatively or quantitatively, where qualitative approach refers to the probability and the effect of risks in words/visual methods, while quantitative approach shows ordinal-scaled numerical points. Organizations can develop the project's performance effectively by concentrating on high-priority risks. Therefore, qualitative risk analysis assessing the priority of identified risks that might have an impact on project objectives as well as on timeframe,

cost, schedule, scope and quality (PMBOK, 2004). Other techniques such as sensitivity diagrams, influence diagrams, and decision trees have been developed in an attempt to make risk analysis more accurate and detailed (Lester, 2014). It is highly up to the company management how to use assessment methods. The biggest bottleneck in getting accurate data for the assessment is the availability and access to data and information required (Figure 25).

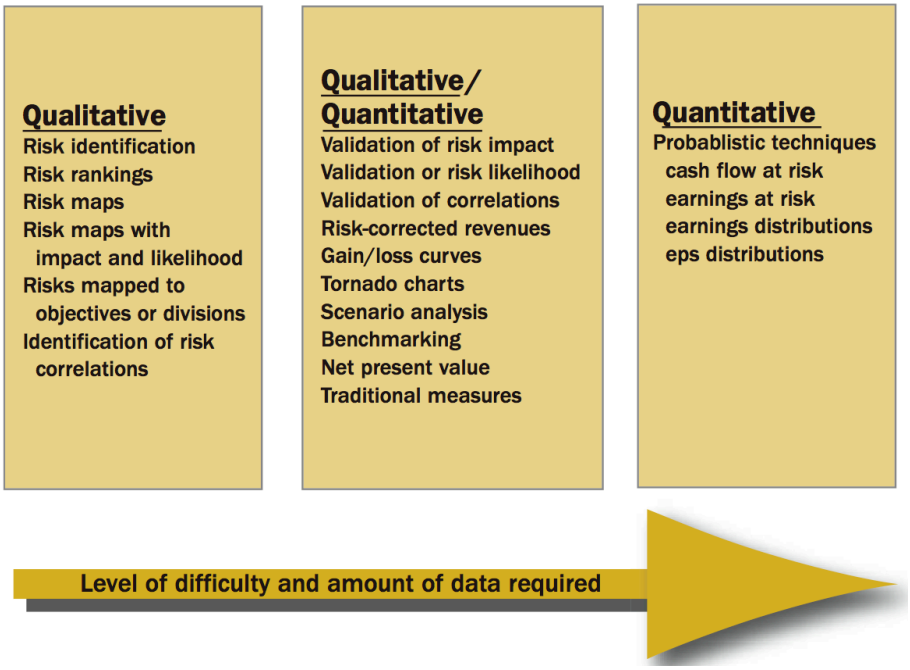


Figure 25. Qualitative and quantitative approaches to risk assessment (IMA, 2007).

Risk assessment/evaluation. According to Berg (2010), risks that were identified and analysed, can be compared to the previously documented and approved tolerable risks. Therefore, relevant managers should develop a plan stating which risks are acceptable and which are not (or not anymore). Taking into consideration particulars of projects, supply chains and industries, risk assessment may significantly vary in a way how organizations perceive the business objectives at current state.

Risk control and coverage/management. Next step is to decide how to cope with identified risks. There are a number of options such as: avoidance, reduction, transfer, sharing, deference, mitigation, contingency, insurance and acceptance (Lester, 2014). Once appropriate actions have been determined, there is a need to assign an individual responsibility for implementing the actions.

Risk monitoring and review. Once the actions are implemented, it is necessary to weigh whether the actions were initiated as planned and whether the actions have been effective in the risk level reduction (Critical Infrastructure Group, 2003). At this stage corrective actions can be taken. To review and keep control of the risks, risk register should be developed that catalogues all the risks and their methods of management.

3.3.3 Risk management process in application to the enterprise model

In organization-wide perspective, risk management can be considered as a basis element of corporate governance. Management is responsible for establishing and operating the risk management framework on behalf of the board (IIA, 2004). Institute of Internal Auditors (IIA) explains enterprise risk management process (ERM) as structured, continuous and reliable across the whole organization for identifying, assessing and deciding on responses to and reporting on occasions and threats that effect the achievement of its objectives (IIA, 2004). Under "enterprise" term it is can be defined a business or company such as public or privately-owned.

Figure 26. Enterprise risk management framework model (adapted from Pickett, 2005).

Figure 26 presents the risk management framework developed to see the whole spectrum of elements of an organization's management system. As it can be seen, there are different levels including strategy planning, decision making on operational risks, implementation of all agreed strategies with the constant reviewing of external forces and active cooperation with stakeholders. Generally, risk management framework is driven by organizations' willingness to achieve its mission (Pickett, 2005). In this model, external global and market developments are mentioned as factors of constantly changing economical situation - interests rate changes, international developments, etc. At the same time, markets developments are the reflections on consumers demand and willingness to use products or services. Enterprises operate in environments where factors such as globalization, technology, and restructurings, changing markets, competition and regulation create uncertainty (COSO, 2004). Another important force is stakeholders "… those people and organizations who may affect, be affected by, or perceive

themselves to be affected by a decision, activity or risk" (Australian standard, 2004). Based on the wide range of external factors, management role is the most crucial in a way whether the corporate objectives will be achieved or not. Pickett (2004) clarifies that risk as a vague concept that quite often correlated with the disasters and accidents that are uncontrollable; risk is something that one suffers in silence and it is impossible to anticipate it or manage. In the whole concept, there is a place for the project and its risk management as a part of the organizational management pyramid (Figure 27).

Figure 27. Risk management processes within the enterprise.

Therefore, this section investigated the concept of risk management processes as a general concept and as applied to the enterprise. As a highlight, it is shown that in a specific case of a single project implementation, it is important to keep in mind that all organization layers are highly interdependent, and the external forces and cooperation with stakeholders affect a balance of possible risks and unexpected scenarios.

3.3.4 Risks classification

Previous subsections aimed to portray risk management main principles and processes, and the connectivity with the organizational strategy. The following part will give an insight on the risk types, their classifications and categorization.

When developing a risk management strategy, it is critical to classify risks according to their characteristics in order to better recognize possible outcomes, and then to shape models that are appropriate for determining those outcomes (Evans and Ganegoda, 2012). So, Finsia Journal of Applied Finance (2008) published the Rumsfeld classification of risks and how better to approach them:

- Known/known (we know the risk exists and we know how to model the outcomes;
- Known/unknown (we know the risk exists, but we do not know how to model it with any reliability);
- Unknown/unknown (we have no idea what risks might exist and, by definition, no idea how to model the risks).

The Rumsfeld classification give very general, in a broad perspective, view on risk types. However, more detailed implications needed when applying to the specific topic. Table 4 presents the most known risk classification system including COSO ERM (Committee of Sponsoring Organizations), IRM standard (Institute of Risk Management) and FIRM risk scorecard.

Table 4. Risk classification systems (Hopkin, 2010).

Standard or framework	COSO ERM	IRM standard	FIRM risk scorecard
Classification headings	Strategic	Financial	Financial
	Operations	Strategic	Infrastructure
	Reporting	Operational	Reputational
	Compliance	Hazard	Marketplace

Therefore, COSO focuses more on multi-levelled enterprise risk types, IRM standard points out types of risks for business activities and decisions, FIRM classification is based on risks consequences. Another example of commonly used risk classification techniques are SWOT and PESTLE analyses. SWOT stands for Strengths, Weaknesses, Opportunities and Threats, and presents a situation analysis. The basic assumption of a SWOT is that company must align internal activities with external realities to maximize its success and minimize risks (Pahl and Richter, 2007). PESTLE is acronym that stands for political, economic, sociological, technological, legal and environmental risks, this classification system is often used as a tool for analysing external risks with the emphasis on hazard risks (Hopkins, 2010).

Another example is a risk management in application to the projects that is associated with the implementation of tactics designed to achieve the efficacious strategy (Hopkin, 2010). Artto et al. (2011) list four different risk types related to the projects:

- Pure risks - unfavourable events such as accidents and losses
- Business risks - variety of risks that may effect the whole project, its objectives and benefits; it includes all risks excluding financial, pure and area-specific

- Financial risks - those risks which related to project financing management
- Area-specific risks - risks associated with the unfavourable events or circumstances in a certain political, geographical or administrative area.

Another, more broad perspective on projects risks categorization is done in Risk breakdown structure (RBS) published in PMBOK Guide (2013). RBS structure is a tool through which there is possible to group project risks and organize them into different categories, which in turn, are broken into sublevels (Figure 28). Every sublevel distinguishes the source of risks to the certain project.

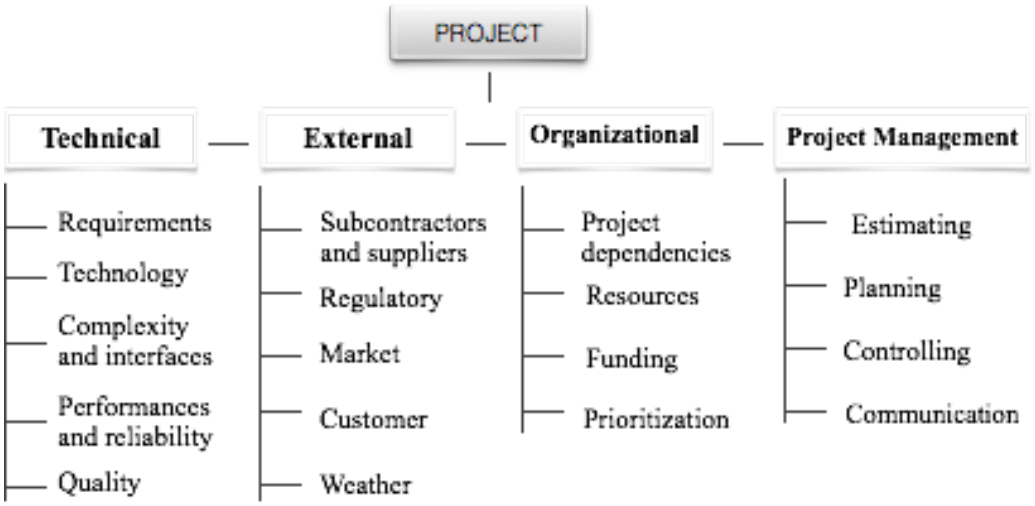


Figure 28. Example of a Risk Breakdown Structure (PMBOK, 2013).

Having discussed different perspectives on risks classification and categorization techniques, it is important to highlight that risk types and their classification systems are highly differentiated according to its size, nature of risks and their complexity. Also, to address the specific needs of industry-wide projects, the best possible option is to make a specific classification of risks that can be successfully identified in a related area. Customized analysis for risks types can be the time-consuming activity, but the outcomes will results in the finding the most applicable model for their utilization.

3.4 Risk management application model for IATA e-freight

E-freight is an industry-wide project that was initiated by IATA as an important step towards the paperless air cargo industry. With the highly complicated supply network and a great number of stakeholders involved (public, state, privately-owned companies, etc.), and the specifics of international operations, implementation of this project has become a long staged process. As obvious, it requires a lot of coordination from the initiators to balance all the processes in a way not interrupting or stopping them while making changes towards paperless. Application of risk management practices to the ongoing process of e-freight implementation may noticeably help all parties to go

through it minimizing risks and uncertainties. As any other stakeholder, Origin GHA (Figure 29), for example, might implement risk management practices and tools and work on identification of weak points of the process, consider any unexpected scenarios, evaluate probable consequences and find ways to mitigate or cope with risks and uncertainties associated with e-freight project implementation.

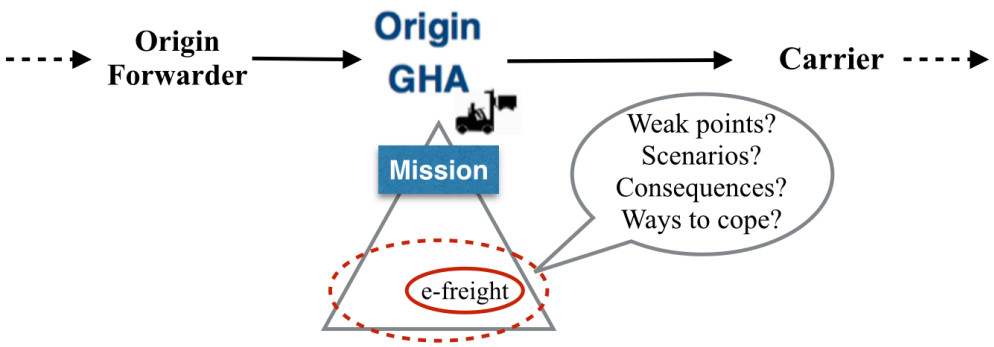


Figure 29. Origin GHA's risk perception on e-freight implementation.

The following Figure 30 presents a viewpoint how to level the risk management application to the e-freight on macro level and on micro level. Firstly, it is essential to look at the air cargo supply chain as a whole (macro level) and to reflect the major challenges and weak points regarding the e-freight implementation (assessing Pillars of a Roadmap). And secondly, to go deeper to the stakeholders' organizational level (micro level) and analyze their perspective on possible risks that appear on operational and strategic levels while implementing e-freight.

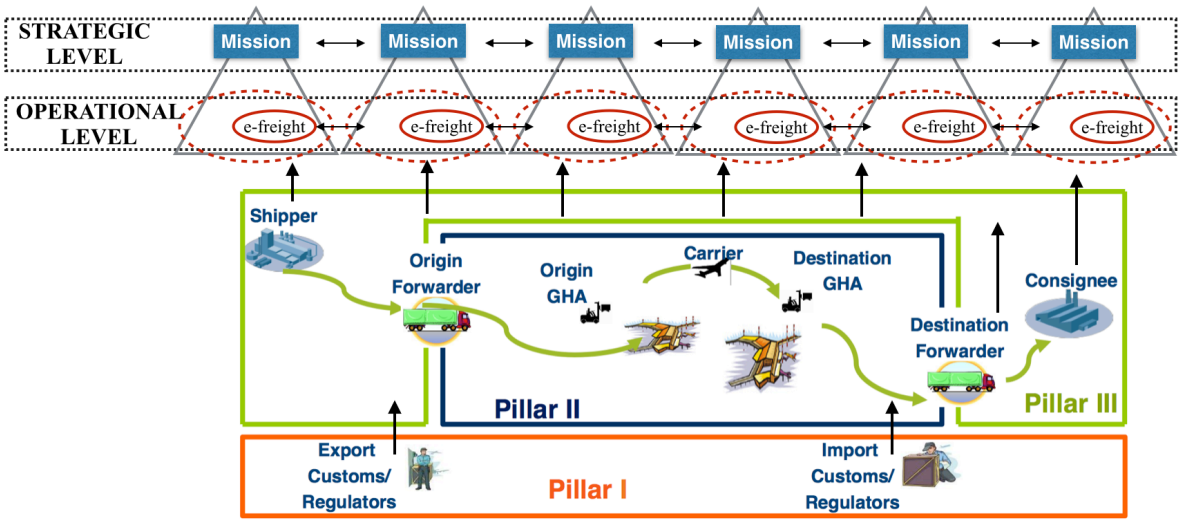


Figure 30. Risk management application model for e-freight project.

Therefore, Chapter 3 discussed air cargo supply chain and associated complexities in it, described IATA e-freight project and its specifics, portrayed risk management processes applied to single projects and to enterprises. As a summarization, risk management application model was presented to show how it is possible to view risks associated with an industry-wide initiative, but at the same time not disregarding the stakeholders' organizational risk management processes. The shown model also gives an insight how all stakeholders involved in air cargo supply chain are interdependent on the way to implement e-freight successfully for the whole industry.

4. AIR CARGO FINLAND

The fourth chapter of this master thesis introduces Finnish air cargo industry as illustrative example of the industry where IATA e-freight implementation is at the beginning phase. To examine conditions and probable risk scenarios that can affect industry-wide project implementation, it is needed to analyse all dependencies that may have influences on e-freight adopting process (Figure 31).

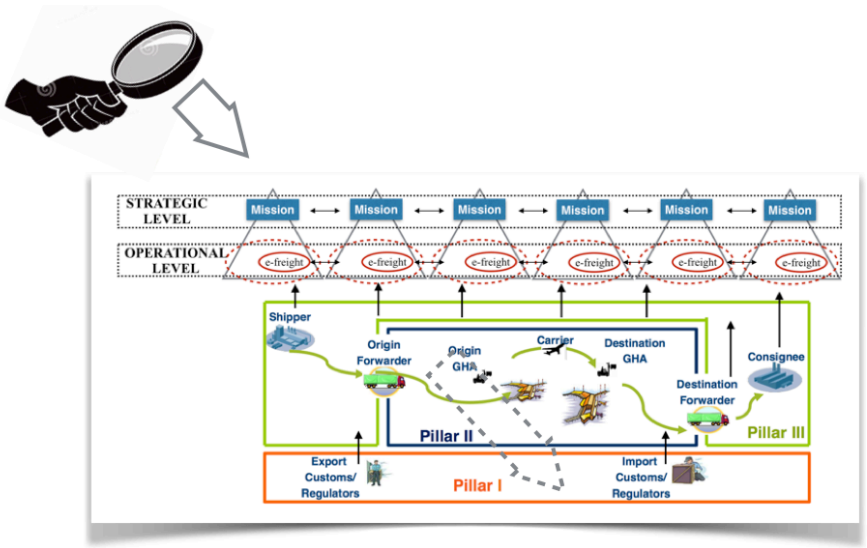


Figure 31. Logic of the fourth Chapter.

Chapter starts from the introduction to Finnish air cargo industry and current state of e-freight. Discussion covers the topics of market situation and tendencies that have impact on cargo business, also derived dependencies in supply chains are examined. Then, next subsection aims to analyse the supply chain readiness for being paperless. Identification of the most painful gaps between the real situation and ideal situation portrays how industry can address IATA Roadmap including correspondence to the planned duration. Also, existing industry solutions are shown to see what kind of tools were developed by IATA to support such a drastically transformation towards paperless. Finally, subsection 4.3 presents the analysis of the risks in Roadmap Pillars I-III. It gives the results of risks management application to the e-freight adopting process from the stakeholders viewpoint.

4.1 Finnish air cargo industry

The great Charles Darwin once stated, “It isn’t the strongest of the species that survive, nor the most intelligent, but the one most responsive to change”, and this phenomenon surprisingly fits to the modern business realities. The air cargo market has very specific characteristics - high average growth rates and high sensitivity to fluctuations in the global economy (Reinhold et al., 2012). Environments, in which organizations exist, constantly experience the changes, therefore, it also underlines that organizational ability to change is the essential key requirement for ongoing success (Journal of Management Services, 2008). Air cargo industry is not an exception and this Chapter reviews an example of Finland facing the change towards paperless.

4.1.1 Overview

Air transport infrastructure combines all the airlines together with the airports, navigation service and all other ground services that all in total carry over 14.2 million passengers and 157,000 tonnes of air freight to, from and within Finland (Oxford Economics, 2011). In general picture, air freight characteristics are one of the most apparent in the data on different transport modes (air, sea and land transport). For example, if comparing weight and value of goods for EU trade and the rest of the world, air transportation accounts less than 1% of the tonnage of EU trade while it comprises over 22% of the value of this trade (Figure 32).

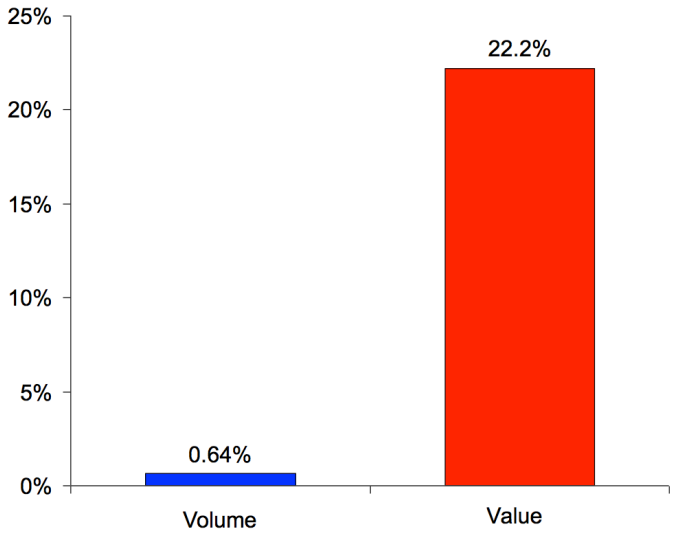


Figure 32. Proportion EU trade with rest of the world transported by air (Oxford Economics, 2012).

Over recent months European airlines improved in air freight demand. As follows, local carriers practiced 1.8% increase in Freight/Cargo Tonne Kilometres (FTKs) in July 2014 compared to a year ago, but regional statistics revealed the decrease. The Ukrainian crisis and resulting sanctions lead to the downward pressure on the growth rates for

some European countries. This crisis has weakened both consumer confidence and economic activity in Europe (Finnair Cargo, 2014). As the result, 1.1% of Freight Load Factor drop fastened in July 2014 (Figure 33).

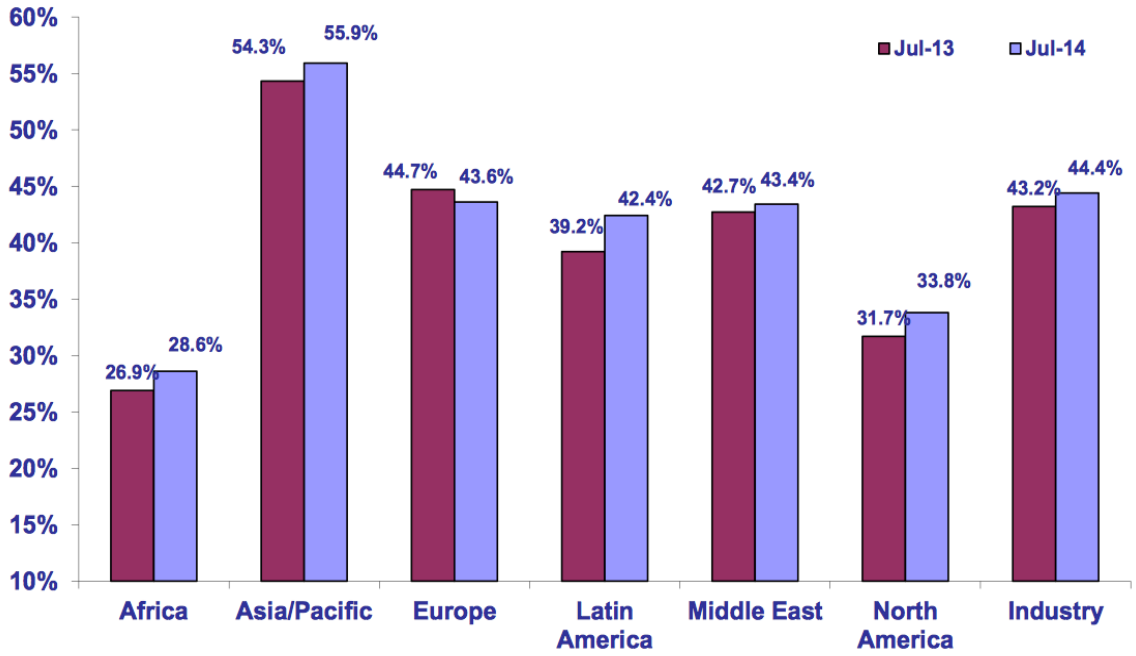


Figure 33. Total Freight Load factor by Region (IATA Air Freight Market Growth, 2014).

Looking particular at freight distribution from or to Finland, over half of the total tonnage is linked to the Asia Pacific region, and more than 40% exchanged with Europe, and the rest of the world accounts for 7,3% (Figure 34). This clearly shows how Asia Pacific and Europe markets are essential for Finish international trade.

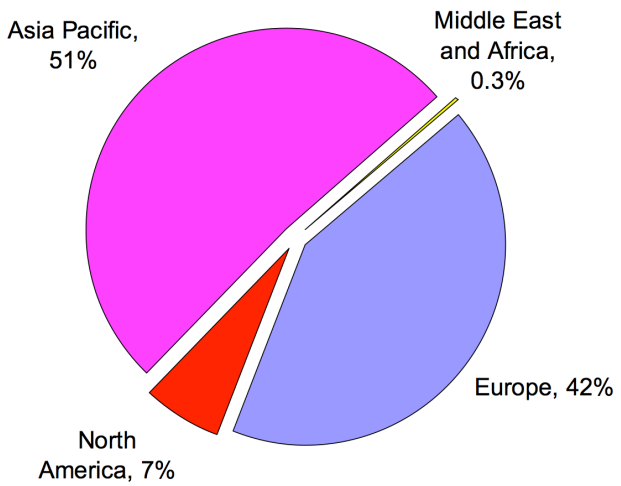


Figure 34. Finnish air freight distribution (Oxford Economics, 2012).

Air Logistics Management Journal (2013) presents a report saying that air cargo industry's contribution to the world economy is believed to grow at a slow annualized rate of 0.7% over the ten years through 2017. Besides that, GDP rate is expected to grow at an annualized 5.3%. GDP and economic activity status are considered as the most central drivers of air cargo growth, but other external forces and constraints should not be neglected (Hertwig and Rau, 2010).

As previously stated, air cargo industry is very sensitive to the global economies, and, forecasting nowadays does not guarantee any accurate results. Referring to Finnair Managing Director Juha Järvinen, air cargo industry started year 2013 with a strong belief in market growth, but unfortunately positive changes in demand did not happen as it was predicted (Finnair Cargo, 2014). With a high level of instability in political situations in some Asian and European countries, economies of those countries suffer and influence the international trade. More to say, as it happened in summer 2014, such international issues as economic sanctions for Russian Federation were followed by tit-for-tat sanctions which dramatically influenced Finnish economy. Taking into consideration that Russia is Finland's third largest export market (Suoinen, 2014), air cargo volumes dropped significantly due to product embargo announced by Russia.

4.1.2 Supply chain characteristics and common risks

Air cargo industry in Finland is following the common worldwide principles of air transport organization. As it has been previously discussed in section 3.1.3, key industry players make the air cargo supply chain and by providing services allow cargo moving from the origin consignor to the destination consignee. All parties have a shared responsibility regarding the safe and secure air cargo moves through the chain (ICAO, 2013). The role of consignors can play big industrial manufacturers as well as small and middle-sized companies who wish their products to be delivered by air. At the same time the sender's role can play an individual who wishes to initiates the goods movement. Consignees in Finland are the same parties as everywhere in a world - individuals or organizations to whom the cargo was assigned to be delivered. The purpose of cargo delivery to the certain consignee is not in the scope of knowledge for supply chain members between consignor and consignee. Goods can be placed for immediate use (products, medicines, etc.), reselling (cars, cloth, etc.) or any further processing (spare parts, cables, computer parts).

International orientation of flight routes reaffirms the similarities of air cargo supply chains in a worldwide scale. On the other side, the air cargo industry contrasts considerably with passenger carriers or those using other transportation modes. By its nature, Finnish air cargo is also represented by its intermodal nature where different land transport segments included in a chain. Therefore, multimodal operations for moving goods from their origin to the final destination increase the chance of risks occurrence

significantly. Next paragraph will present some of the most known risks that exist along the process of air cargo transportation.

With a fact that more actors involved in the air cargo movement, there is a higher degree of complexity and risk to *operations* (Rushton et al., 2010). Another crucial part is *physical risks* such as accidents. According to the "Safety Aspects of Air Cargo Operations" study (1999), air cargo operations encounter much greater safety risks than passenger airlines. From the *financial perspective*, air freight operations are capital-intensive and heavily-rely on forecasting. As previously discussed, nowadays it is impossible to forecast side effects on the cargo business, and, this fact can negatively reflect on inappropriate investment decisions. The same perspective can be applied to the air cargo *demand forecasts* where inaccuracy affects the whole planning stage. Next risk is about *cargo theft.* Palmer (2010) states that the economic crisis that had place in 2008 has increased unemployment on a global scale that affected the degree of the cargo theft risks.

Supply chain characteristics and common risks discussed in this part aimed to show that Finnish air cargo industry follows the general pattern of doing this type of business in a worldwide scale. It also clarified that besides the nature and origin of goods, risks are common for any cargo moving through the supply chain.

4.1.3 Derived dependencies

Topic of the air cargo supply chain risks touched slightly in this paper to give an insight how risks have different sources and each of them cannot be neglected. More detailed information can be found in different literature sources specialized in SCRM. Being focused on identification of e-freight project implementation risks, this section examines the dependencies in communication between parties. More particularly, electronic messages exchange discussed in detail.

As shown in subsection 3.1.1, there are different types of flows that compose exchanges in supply chains: goods flow, money flow and communication. From the general theory of goods flow, air cargo chain replaces it with cargo movement from the consignor to the consignee. And money flows evidently exist in the course of the chain and follow the standard way of supporting all business activities between parties. In relation to the e-freight project in air cargo supply chains, there is a central idea of changing paper-oriented flow of information to the electronic messages exchange. Sharing information within the supply chains make organizations more agile and faster to respond to market changes (Lee and Whang, 2001). Proper process of messages exchange would guarantee e-freight project success in a long run, but due to the supply chain networks complexity it becomes the most difficult task to do. Figure 35 presents IATA representation of a standard EDI (Electronic Data Interchange) in e-freight environment. Clarke (2001) defines EDI as the exchange of information between different organizations in uni-

formed electronic form that is fully automated; it allows users high speed information transferring, minimizing mistakes and avoids re-capturing of the data that makes communication more efficient and effective. EDI in e-freight are standard electronic messages based on a defined IATA, the United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) and the World Customs Organization (WCO) standard (IATA Handbook V3.1, 2012).

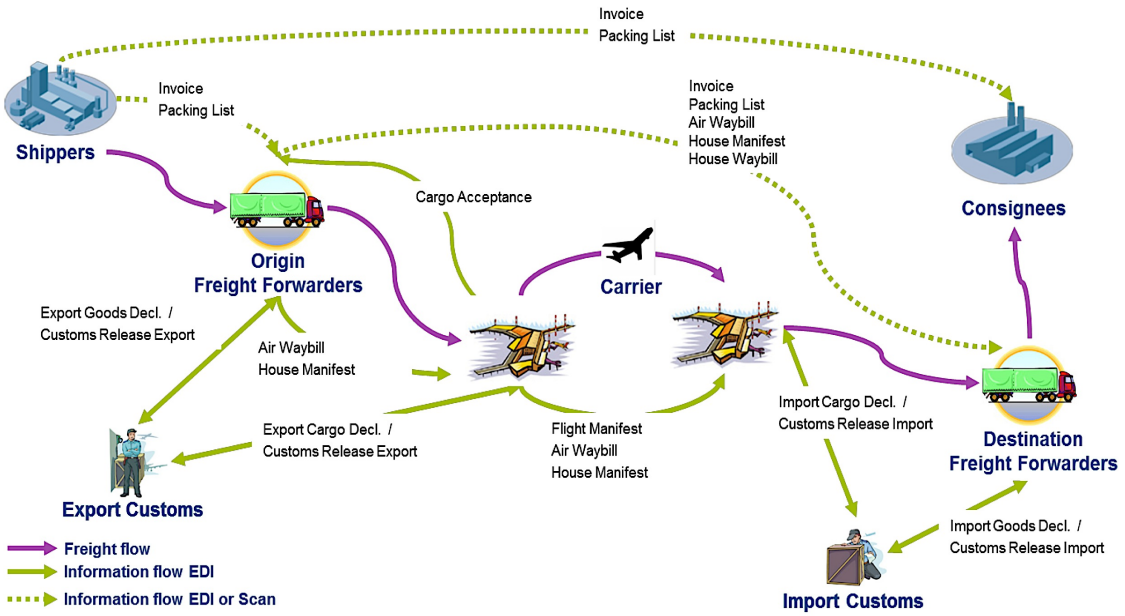


Figure 35. Standard e-freight flows (IATA Handbook V4.0, 2013).

More specifically, it is shown that freight forwarder at origin consolidates shipments that come from various shippers and composes a single consolidation. By acting in this way, it executes the brokerage activities and performs a final delivery. Physically, cargo movement follows the general path of goods flow from their origin to the final destination disregarding the associated changes for e-freight. However, replacing physical paper pouches with the electronic messaging drastically changes previously used communication flow between stakeholders. As it can be noticed, not all documents irretrievably become e-formed, some of the documents can be sent as scans by need. This situation can be referred to the international shipments where destination country still needs documents to be printed and stored, or situation when some stakeholders are reluctant to a paperless change. Graphically presented scenario can be seen as the most standard, but for many other situations changes in communication flows are needed. Depending on a point of interest, IATA developed flowcharts such as origin-destination freight forwarders communication, freight forwarder-customs broker, freight forwarder-carrier-ground handling agent communication, etc.

When performing data interchange between one stakeholder and another, it is critically to know that this particular information in a digital form is very valuable for the all par-

ties of the supply chain. But human mistakes cannot be totally eliminated, only rather minimized. Therefore, quality at the source is the fundamental issue for successful e-freight operations. Dealing with mistakes done on papers for many years have grown common sense and practices for the way of their corrections while e-format mistakes raise a great concern for stakeholders. Dependency on high quality information is tremendous to minimize risks and uncertainties for cargo movement processes.

Another dependency to be discussed is "all-the-time on" regime for electronic messaging availability. Any systems breakage or temporary interruption can cause shipment delays or inability to move it to the next processing point. Therefore, impossibility of a planned performance for one of the stakeholders in a chain directly disrupts the whole process and causes additional costs.

This section intended to show different air cargo supply chain flows and interconnections when talking about e-freight project. Obviously, any supply chain player's technical or accuracy standard withdrawal leads to the harmful circumstances for all the following stakeholders as well as for the shipper who is interested in delivering goods as planned. It is in the interest of all parties to syntonize physical goods flow and electronic data interchange to address an initial mission to deliver goods as promised to the customer and to get industry benefits from the waste elimination (subsection 3.2.2). Proper EDI functioning is impossible without a solid technical base and well-trained personnel. To know weather air cargo industry completely ready to a paperless change, section 4.2 will analyze the most noticeable characteristics.

4.2 Analysing existing readiness for e-freight

Organizations try to cope with constantly changing environments by introducing rather innovative ways for businesses. As e-freight is a qualitatively huge step towards lean thinking, proper planning and controlling are vastly essential. In turn, analysis of a current situation is an indicator for all parties how industry is ready for a change. Logically, there are three statuses that are relevant for analyzing industry readiness: traditional situation, current "as it is" and ideal situation of air cargo operations. More specifically, traditional situation overview portrays the way how different stakeholders used to organize the cargo flow through the supply chain; current e-freight situation overview says how successfully it was to start e-freight when it was initiated and how enthusiastically this change was conceived by organization; ideal situation shows the idealistic perspective on a planned e-freight implementation plan without any kind of circumstances that could interrupt the process. Thus, the gaps between these three scenarios are the resonant differences between what is perceived and what is in reality.

Describing traditional situation is not in a scope for this paper and has more theoretical orientation. Therefore, current and ideal propositions are touched as the most suitable

for getting information about the possible gaps that can increase risks for e-freight implementation. Also, industry solutions addressing technical and other non-technical needs are discussed as a way to support maximally all industry players.

4.2.1 Identifying gaps for e-freight implementation

Innovations in logistics are difficult to penetrate and such fundamental changes as to be paperless oblige longer timeframes than it was usually originally planned. However, such bottlenecks as resistance to change from the international laws side, poor technlogical infrastructure and slow adoption processes make e-freight project rather challenging for all parties. From the seven wastes prism, there is an obvious "evolution" of the way to run air cargo business in traditional way, at the current state of e-freight and the perfectly settled position (Figure 36).

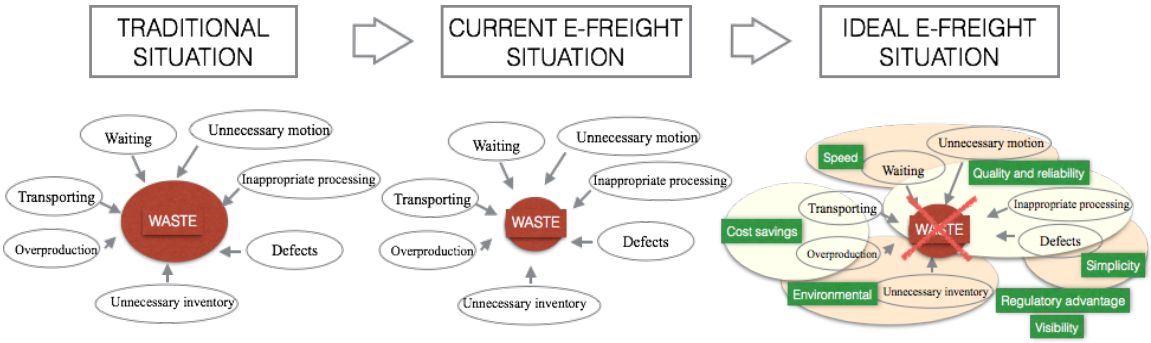


Figure 36. Perspective on seven wastes when identifying gaps for different situational statuses.

As it can be seen from the picture, industry evolves towards more sustainable methods of operations and more efficient ways for the supply chains. As follows, every single air cargo supply chain player is able to reach at some point an ideal scenario. Some of them are currently close to the target, some of them still far behind. To know the gaps, each stakeholder is discussed.

Shipper processes:

The shipper originates the shipment process and the flow of information starts from this point. All trade documents such as invoice, packing list and certificate of origin are mandatory for customs to define customs value of goods. Thus, current shipper's export process means preparing listed documents for a shipment to be picked up by the freight forwarder. In reality there is still a way to print the copies of documents to ensure they are attached to the shipment and to double secure the probable loss during transportation by copying and storing extra copies at origin. Since recently, most documents started to be sent electronically to the forwarder in PDF formats or scans that dramatically shortened the sorting and distributing times and minimized the risks of paper loss dur-

ing transportation. Another aspect to be discussed is a fact of manually re-typing shipment information by the forwarder into its own IT system that is mainly stipulated by different software and program bases in use, and different working templates to be filled in. In an ideal e-freight situation, all trade documents should be sent using XML (Extensible Markup Language) standard that will allow all the parties working on cargo delivery to use this info without extra printing or making changes to convert it into their own systems.

Summarizing, there are wastes to minimize: overproduction, unnecessary motion, inappropriate processing and transporting. Consequently, there are few identified gaps to pay attention on: commitment to paper printing as an old mental model and a lack of integrated software base.

Forwarder processes:

Forwarder export process is what happens after shipper prepared all trade documents, meaning picking up a freight, booking capacity from the carrier, preparation of custom declarations and transport documents, shipment consolidation and delivering it to the specified ground handler. Nowadays almost all listed documents (AWB, HWB, House Manifest, Consolidation Manifest, Cargo Declaration) are digitalized and exchanged electronically between parties. But still, prints are done for storing or just a motion for double safety reasons. The most important benefit of digitalized documents in this case is the great shortening of a lead-time and enhancing quality by eliminating a need of retyping info (manual retyping is replaced with the copy-paste functions to create and fill in necessary documents). In an ideal situation, shipper provides all information in e-form that enables creation transport and customs documents immediately that shortens the process of shipment preparation. Thus, there are wastes to me minimized: overproduction, defects, unnecessary motion, and unnecessary inventory, transporting and waiting.

The forwarder import process is receiving and processing a shipment on behalf of the origin freight forwarder. When shipment is stored at ground handler's warehouse facilities, associated documents are located at the office premises. Documents are gathered to form customs import declaration to allow shipment to be picked up by the trucker and deliver it to the warehouse for temporary storing or directly to the consignee. Current situation still implicates paper copies printing for internal archiving that leads to the unnecessary inventory waste creation. Also waiting waste generated due to the downtime at the moment of final papers processing and archiving. Ideal e-freight status would guarantee shortening lead times and unnecessary inventory by e-filing wide introduction to the industry.

Summarizing, there is a gap identified - resistance to adopt e-filing as a way to eliminate paper storing. This fact can be based on supply chain member's old mental model for information security or due to administrative storing policies.

Ground handler processes:

The ground handler export process is a step when export forwarder delivers freight to the location when it is more suitable to pack and prepare freight to the actual flight; very often ground handlers are considered as airline's continuation and they located mostly in the airport premises to be able reach fleets shortly. Ground handler receives all documents from the origin forwarder and the airline to plan and organize all procedures for freight loading into the booked flight. Nowadays all messages received electronically, but with a high probability of mistakes inside. It is stipulated by the fact of double processing when information is retyped on its way to ground handler. Besides that, for storing and security purposes, all the messages are combined and printed out for each shipment. At the moment when the trucker arrives to the gate with freight, all trade and transport documents are checked at the handler office to allow trucks unloading and packing (very often waiting time for the trucker is about one hour). Then, freight is weighted and measured to adjust data in AWB, and all documents are in place to enable freight loading into the flight. Ideal e-freight situation will let eliminate a process of manual combining of all papers for each single shipment (about 30 pages per shipment) for storing at ground handler warehouse. Integration of electronic identification card readers for truckers' and shortening paper processing and sorting times will prevent waiting time at the points of freight unloading.

Thus, there are wastes to be minimized: defects, unnecessary motion, unnecessary inventory, inappropriate processing, transporting and waiting. Summarizing, there are gaps identified - lack of integrated software solutions to guarantee same standard XML messages, inability for just in time freight delivery due to the time spend on paper processing, and resistance to use e-filing systems.

The ground handler import process is the next step after airplane lands at the destination airport and freight needs to be transported to the warehouse. Ground handler import office receives electronic messages from the airline about a landing status. At the same time there few manual operations to be performed in the office like transport documentation copying, sorting and boxing documents for the freight forwarder. Then, freight pickup time discussed and agreed between parties. Again, when the trucker arrives to the ground handler warehouse, identification process takes time plus documents' physical transfer is done. In ideal e-freight situation, the chain of communication will look like that: airplane lands and a notification of arrival is distributed electronically to all the supply chain members involved in freight transportation. Then, it allows freight to be unloaded by the ground handler and be transported to the warehouse. When the

trucker arrives to the warehouse gates, identity is checked automatically and documents transfer is not needed anymore - freight loaded and directed to the forwarder's warehouse or directly to the consignee.

Thus, there are wastes to be minimized and eliminated: overproduction, defects, unnecessary motion, and unnecessary inventory, transporting and waiting. Summarizing, there are few gaps identified that are mainly reflected from the situation with the ground handler export process lack of integrated software solutions to guarantee same standard XML messages, inability for just in time freight delivery due to the time spend on paper processing, and resistance to use e-filing systems.

Carrier processes:

Carrier export process represents the freight transportation part and mainly does not create a waste. In a current situation there are few paper copies are printed (AWB and FFM) for accounting and storing purposes. The following messages are exchanged between the origin carrier, destination carrier and the ground handler: FWB, freight booking list (FBL) and FFM. In the ideal situation the freight forwarder provides qualitative documentation in the e-form by XML standard messages that allows carrier to conduct FBL and final FFM messages. In case of a weight or size deviations, ground handler updates this information in a system and it is automatically updated in all stations. Right after a fleet takes off, stakeholders get updated information about the flight status that helps to organize activities for the following operations with the cargo transported by the air.

Thus, there are wastes to be minimized: defects, overproduction and unnecessary motion. Summarizing, there are few gaps identified: resistance or inability to use widely e-filing systems and the lack of connection to the integrated software solutions that would connect all air cargo supply chain members.

Carrier import process does not create a lot waste the same as export one. All the manual operations performed by the origin ground handler who needs to unload a plane and inform the destination ground handler about pick up time. Carrier is obliged to send a notification of landing message to the ground handler after which ground handler can start the process of unloading a plane and cargo unpacking. Nowadays some paperwork still takes place when ground handler moves some documents to the import office to organize transport costs collection. In ideal situation, no papers carried with the freight, therefore, no papers to be delivered to the ground handler import office. The only message that can be needed is an electronically sent message from ground handler to the carrier about the status of a freight being unloaded.

Thus, there is still one waste identified - transporting, that is determined by the paperwork delivering to the ground handler import office and it's processing. Summarizing, it is seen that there is a small gap to eliminate a waste between current and ideal e-freight situation - lack of integrated IT software base.

Having discussed the most visible industry wastes in a current state of air cargo operations, there are gaps identified. To minimize the wastes means to decrease the gaps between what is now and what is going to be in a perfect e-freight scenario. E-freight project was developed and tested in many stations worldwide to identify the most probable omissions in a plan for e-freight implementation. It took more than five years to realize how industry players reflect on e-freight ideas. As it was shown earlier, Finnish air cargo industry is nothing specific to the world pattern, but as any country it has its own way for accepting industry wide programs and its own legislation that should not be neglected when planning the actual program start. Next section will examine the existing air cargo industry solution for minimizing gaps, and therefore, risks for e-freight successful implementation in Finland.

4.2.2 Industry solutions

There are few industry solutions that were established to support e-freight smooth implementation and, therefore, minimize the risks and their consequences. So, this subsection will examine the topics of eAWB as a first step to e-freight, and the most essential technological solutions to enable paperless communication.

Date of 14 of August 2014 was a planned deadline for implementing the e-AWB (electronic Air Waybill) Single Process in the Nordic Region. IATA member airlines such as SAS, Finnair Cargo, Air France, Korean Air, Cathay Pacific, Qatar Airways and Emirates played a role of the newcomers in the Nordic market to start eAWB for all airfreight shipments.

IATA has set ambitious goals for the physical AWBs that were designed more than eighty years ago - to become electronic (eAWBs) by 2016. In particular, to achieve 22% implementation by the end of 2014 and 80% by the end of 2016 that is covering 4,111 airports and 827 forwarders who officially signed the Multilateral e-AWB agreement (Air Cargo World Magazine, 2014). In the Nordics, in particularly, 90 freight forwarder companies joined Multilateral agreement at the stage of its launch. The Single Process is the standard that enables all shipments to be accepted at a terminal without a paper AWB, and full benefits are going to be realized at the time when all thirteen carriers in the Nordic Region Single Process Team achieve full implementation (Finnair Cargo Website, 2014). Referring to Petteri Hellen, manager of e-Solutions, commercial partners and global mail at Finnair Cargo, the main aim for the Single Process is to encourage forwarding agents to implement full e-freight and eAWB (Finnair Cargo, 2014). It will ensure large amounts of data to flow through the whole supply chain without any

need for printing and storing. Based on the e-AWB international monthly report by IATA dated by August 2014, Finland ended up at 37th place in the International ranking of top-50 countries of origin ranked by e-AWB volume. And in a global scale (Figure 37), August 2014 showed 19.4% e-AWBs penetration that is higher than July figures for 2% for all countries.

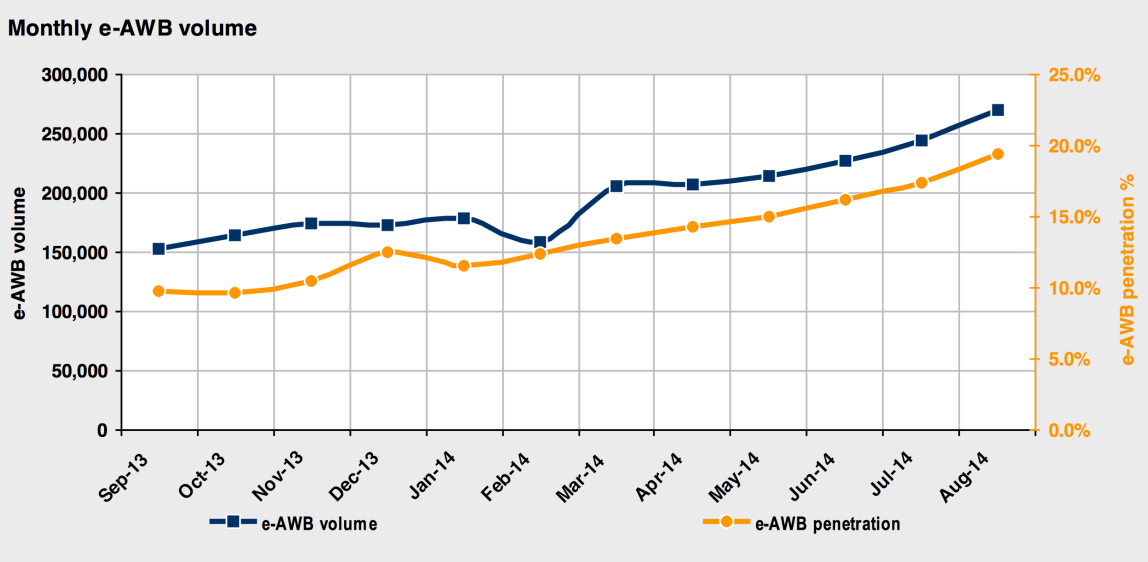


Figure 37. Monthly e-AWBs volumes (IATA, 2014).

Next topic to be reviewed is information technology that is the main driver of the paperless cargo idea. Having modern technologies highly secured allows their use in many industries such as banking, pharmaceuticals, commerce and all transportation industries including air cargo. Information technologies nowadays enable really fast and consistent electronic documents exchange and their integration into the business processes. IT solutions providers support e-freight business processes with different message standards, interfaces, integration platforms, web portals and management systems (IATA Handbook V4.0, 2013). More specifically, according to IATA explanation, IT solution providers for e-freight comprise:

- Integration platforms providing Cargo Community systems services, Cargo 2000 Data Management Platform for such players as freight forwarders, carriers and customs, data transmission services, data archiving and web portals. These solutions are available for all supply chain members.

- Software editors of management systems for carriers, import and export ground handling agents, freight forwarders, customs and consignors.

IATA actively participates in a constant reviewing of all IT solutions to ensure that they address all the relevant needs for e-freight. This helps to guarantee that IT providers' keep focus on the main goal of closing all the possible functional gaps for e-freight im-

plementation. As earlier discussed in the previous section 4.2.1, there are few possible ways for exchanging information between parties, but still, the main idea is to introduce the most efficient integrated system. IATA contemplates three different scenarios: system-to-system integration, web portal and email exchanges (Figure 38).

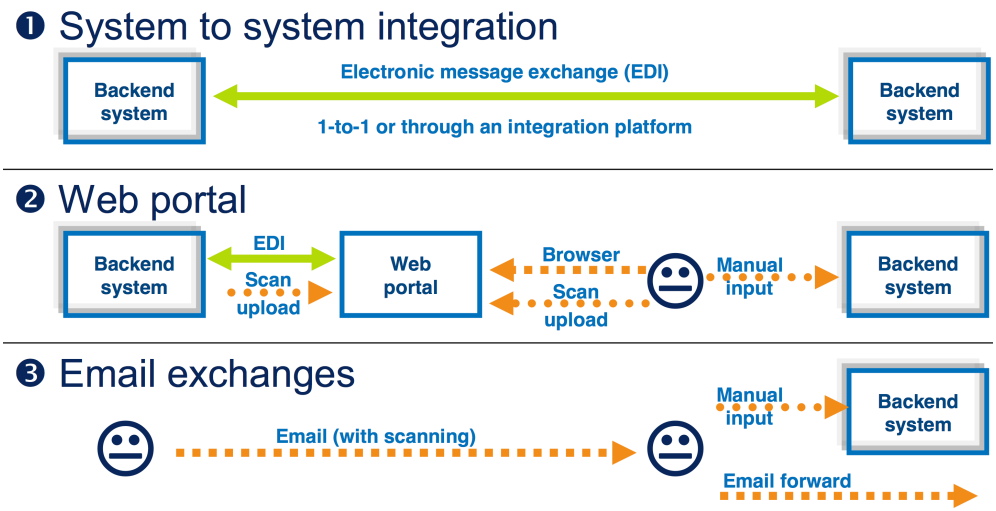


Figure 38. Information exchange modes (IATA Handbook V.4.0, 2013).

Scenario 1 shows how system integration allows direct information exchange between stakeholders' applications. Scenario 2 is designed for a situation when some documents scanning and manual work is needed to complete procedures. And Scenario 3 examines a way when full integration and web portal use are not possible for corresponding parties, for this case paperless data exchange is still possible by the cooperation through e-mails and other scanned attachments. Based on the presented scenarios, IATA still points out that the most efficient way that is introducing integrated platforms to enable one to one connection (Figure 39).

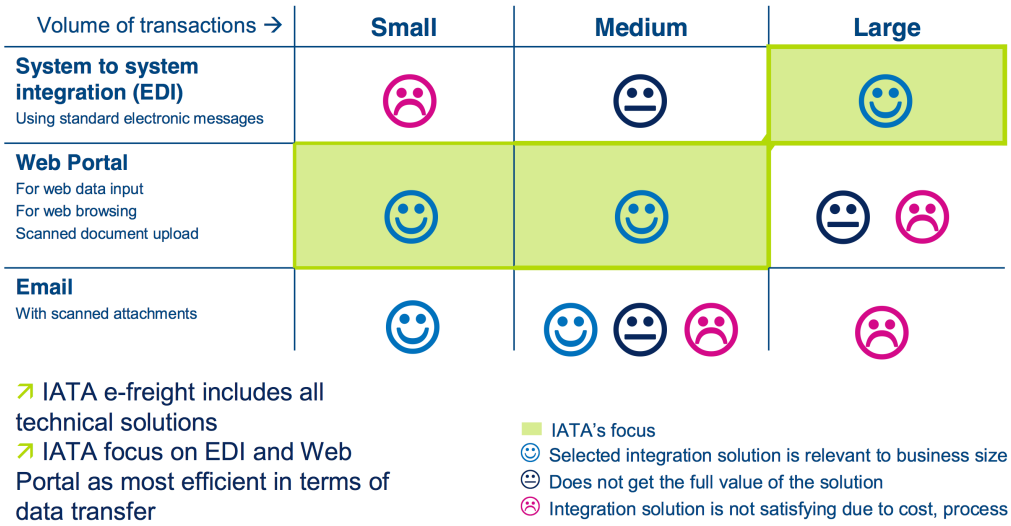


Figure 39. Efficiency of the selected information technology modes (IATA Handbook V.4.0, 2013).

System to system integration is the most capable configuration that allows bringing the highest value for the big volumes data transactions. Managing multiple data exchange channels is centralized that minimizes possible errors and defects.

At conclusion, existing industry solutions are the examples of the real tools that are available for all air cargo supply chain members to settle a strong technical base for successful e-freight implementation. As it was pointed in the previous subsection, there are still gaps that place in question the industry readiness for paperless operations. But with the constant support from the project initiators and, what is most important, from the stakeholders' willingness to start the paperless cargo shipments, process can achieve its goals. Next sections present the actual findings from the research regarding the industry readiness on operational level, probable resistance for information technology solutions, interdependencies on the strategic level and other factors, where part of them can be considered as risks for e-freight smooth implementation.

4.3 Analysing e-freight Roadmap risks

The actual e-freight implementation planned deadlines were moved few times to the latest dates as a result of constantly evolving barriers. The reasons could be different - from the industry unreadiness due to the big gaps identified, technical infrastructure solutions or legislation barriers. In each single scenario e-freight project initiators were developing the models to foresee all the risks that might appear before the real project starts. For the last years pilot projects were successfully implemented in many countries worldwide and gave fruitful foundation for those who just start. So, e-freight implementation in the six pilot locations was effectively achieved on November 5th, 2007 (IATA Handbook V.4.0, 2013). However, every country or region has its own uniqueness and distinguishing features that affect the process in some ways.

To identify risks for Finnish air cargo industry, interviews with stakeholders from the supply chain were done to see quite different perspectives on the change towards paperless. List of questions for interviews and questionnaires that were used for this research attached in Appendix. Identification of risks in the industry-wide project could not be possible without a professional opinion from inside the industry. Therefore, various stakeholders' representatives from different parts of the supply chain were interviewed regarding the topic of risks identification and e-freight impact on the industry. List of professionals interviewed also attached in Appendix. Professional opinions helped to visualize how previously identified gaps in the industry readiness towards paperless change. Quite important to note that both operational level and strategic level personnel took part in this research that made possible to see interdependencies in the real cases.

4.3.1 Pillar I

Pillar I is set with a purpose to establish a route network (Figure 40) and let e-freight processes to be live, it is lead by IATA with support from all GACAG organizations and their members. Engaging regulators to establish a network for free digital environment meaning paperless customs/regulators procedures. More detailed, start using customs declarations electronically, eliminate a need in showing original paper documents and get a channel to accept documents in electronic formats. Key goal was 80% coverage by 2015, but still some blames and concerns rose among stakeholders regarding the customs passiveness.

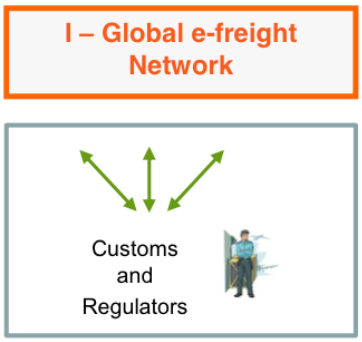


Figure 40. Pillar I (IATA Website, 2014).

As *Forwarding Agent* states, *"Customs officers are the most reluctant to the paperless initiative"*. This is an irrefutable fact that lies on the surface and significantly prevents further development. Customs reluctance is not a common sense, but mainly determined by the economical element. Development level is different for different countries worldwide. For some, technological progress is the way to lead the industries and achieve high performance by innovations. For such developed countries as USA, Great Britain, Germany, Austria, Belgium, Finland and others, technological innovations are deeply integrated into people's lives and became a powerful business tool already two decades ago. On contrary, developing countries are far more challenging in a sense of innovations accessibility.

"Based on the business experience of dealing with local companies and customs, we can see that some South American countries are not ready for the change to go paperless", *Forwarding Agent* claims. *GHA*'s position is not different and as an unaccounted challenge it is questioned - *"Some American and Eastern European countries have very strict customs position, and how in this case everything all of a sudden can turn into e-freight?"*

In this sense it is obvious that improved IT solutions and highly customized applications cannot be integrated within the deadlines for IATA key goal of 100% e-freight shipments. Other side of the customs visible reluctance lies in the fact that regulators are

strictly chained to the traditional processes. Paper document is a physical document that obliges the performer to follow the agreed standard procedures and bear responsibility as set forth by law. Paper is signed and stamped that double confirms the parties' obligation and clearly shows the data originator.

From the information exchange perspective, having customs offices not ready for e-freight processes will not interrupt the whole initiative, but partly decreases e-freight plan fulfillment. So, it is realistic to have shipments mainly with electronic documentation and to issue paper versions just for customs on request. In this case, situation of mixed approaches is acceptable but does not address the goal of full e-freight strategy. It is supported by the *Carrier* side that supposes, *"... among with the other air cargo supply chain stakeholders, import customs are the most risky in terms of responding to the e-freight goals"*. Considering different external forces from the side of economical situations and political instabilities, customs are the most connected to the regulation bases. But still, any negative economical or political scenario primarily affects the cargo business itself (volumes transported, amount of business agreements), but not the e-freight initiative itself. It can be also referred to any of natural disasters.

Based on the gathered information regarding the influences of some factors such as human reluctance, addressing IATA e-freight goals, IT infrastructure readiness for electronic messages exchange, economical and political possible influence on the e-freight project implementation, Figure 41 presents the findings in a risk matrix for Pillar I.

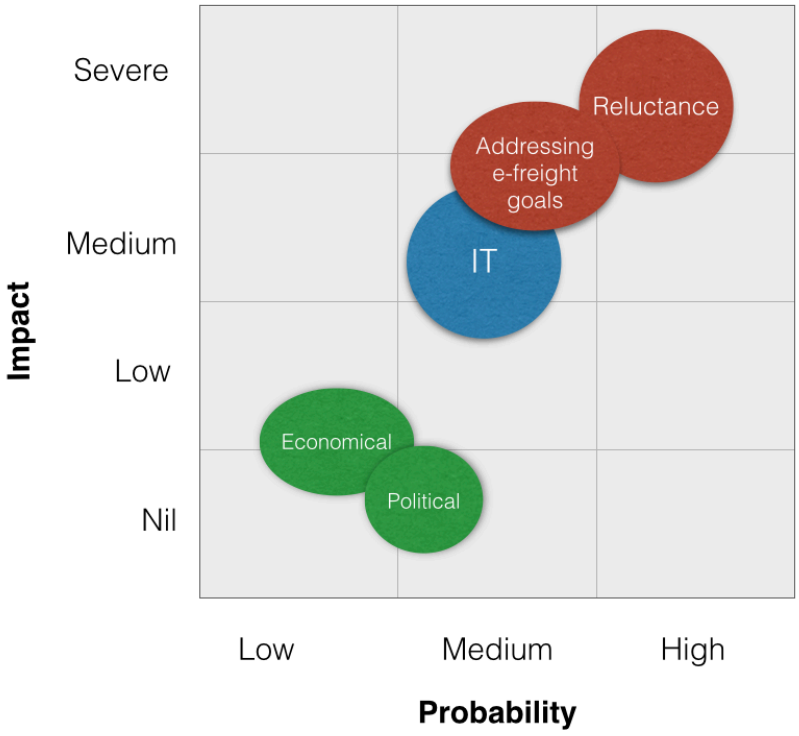


Figure 41. Risks matrix for Pillar I, Customs.

From the risk management perspective, there is no significantly valuable information gained from the research for risks identification for Pillar I. It is reflected as normal in a way of considering limitations of data accessibility. In general, it is referring also to the shipment originator (consignor/shipper) and receiver (consignee). Both consignor and consignee are in some way "customers" for the transportation industry, where customs and regulators are the parts of legislative authorities. Pillars II and III depict the most active players involved in cargo transportation and discussed in the next subsection.

4.3.2 Pillar II

Pillar II is set with a purpose to achieve industry capability for paperless airport-to-airport chain, to remove core transportation documents. It is lead by IATA project management in close cooperation with FIATA. Key goal was 100% coverage by 2015. Pillar II relies on close collaboration between freight forwarders, ground handling agents and airports (Figure 42). The level of interaction was discussed in detailed in derived dependencies subsection of this paper. Therefore, one of the parties' inability or reluctance to implement a change heavily reflects on the paperless airport-to-airport idea.

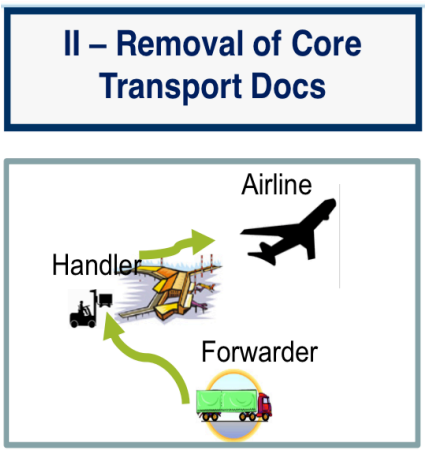


Figure 42. Pillar II (IATA Website, 2014).

As *Carrier* declares, *"For forwarders it is easier to forward documents than to type in necessary info"*. Another carrier gave the same comment regarding forwarders' reluctance, and all other parties interviewed for this research have similar views. *"Forwarding agent creates the original data that later used by other supply chain members; data should be strictly correct to avoid the massive failure of the shipment delivery process and ability to process it at other steps"*, summarizes *Carrier*.

Alternative perspective is given considering the conservatism-type processes for forwarders. So, for many decades of years forwarders used to work with paper documents as the only way to perform their tasks. *GHA* comments: *"Original forwarder is the most*

reluctant part of a chain due to the fact that the whole process is paperless, but forwarder still delivers papers". In a big picture, human reluctance factor and deeply chained ways of daily processes slows down the paperless initiative integration. As *Carrier* points out, *"...it is a barrier for e-freight that people are just frightening to remove paper from their operational processes"*. In particular, as the most risky players in a way of addressing e-freight goals were pointed small forwarders. *Carrier* says: *"It is hard to get advertising value for the investment"*, therefore, small forwarders are the less interested in this change. Additionally, interviewed GHA agrees on the fact that destination GHA is the most responsible for a consignee - for closing all the mistakes in a paperless process, therefore, very risky in terms of responding to e-freight goals as well as small forwarders.

Capability of investing in a change is another building block affecting the successful implementation of a full e-freight. *Carrier* states: *"The change is much easier for big companies"*. Accordingly, big investments required for IT base installation for smaller companies are challenging. This fact is directly reflected on a willingness to implement a change, therefore, raises reluctance. For small forwarders, for example, it can be a need to outsource IT or to agree with GHA to perform data entries on behalf of a forwarder, etc. *"IATA deadlines are close, but still no proper testing period had place for electronic messages exchange", - GHA*. Carrier also shares the same viewpoint and adds the special note regarding the fact that quite interestingly, but GHAs underestimate the change they face. In fact, it puts some stress on more personal attitude to a question and on a way how GHA companies understand the drastic change in operations. Freight Forwarder, who thinks that IT systems are too vulnerable, express a need in additional safety plans for preventing messages delivery failures. If message delivery is in trouble, there is a high potential of money loss. Going back to the different countries' statuses situation, it is important to highlight that IT infrastructure in some less developed countries may be not ready for a change that again refers to the situation of a partly digitized documentation in these cases. Finally, *GHA* summarizes: *"Current IT infrastructure position is a real barrier, fallback plans and periods are far from a well-organized process"*.

Detected big concerns regarding IT solutions for a paperless change between stakeholders makes *"paperless transportation really strange idea to most people"*, suggests *Forwarder*. It is supported by the fact that very often cargo professionals do not have knowledge how those solutions actually work. An illustrative example is a likelihood of a system failure when it happens during ongoing process of loading a shipment in the hub terminal or getting a shipment out of the airport terminal. Lack of confidence in a stable IT platform results in a great concern for operational professionals such as Forwarders and GHAs.

Summarizing, Figures 43, 44 and 45 show the risk matrixes developed for each of the stakeholders in a way what kind of risks were identified from their side in reference to e-freight implementation. There are different factors were identified for different stakeholders. Colorful representation of risks also helps to recognize from most probable/most harmful to less probable/nil harmful.

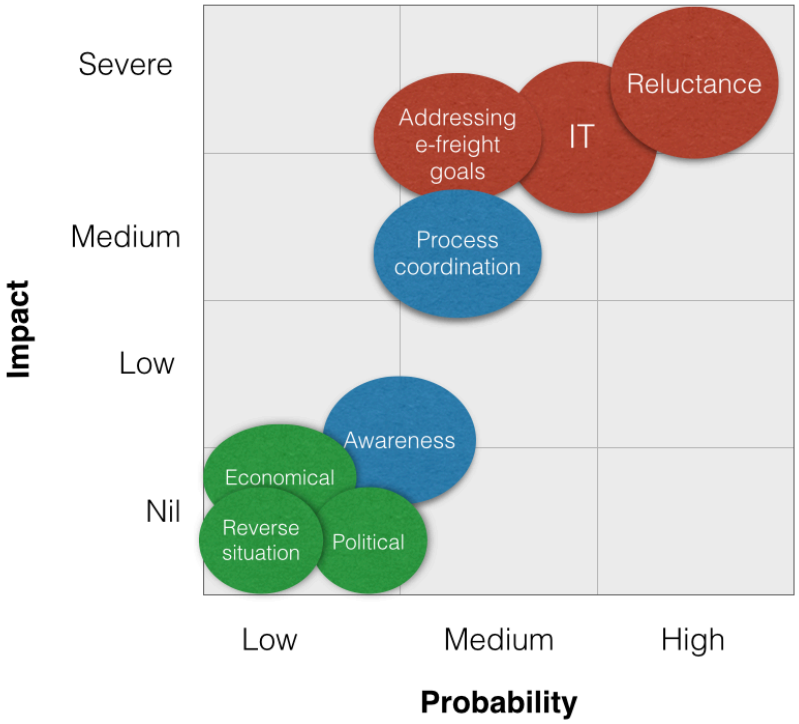


Figure 43. Risks matrix for Pillar II, freight forwarders.

Figure 43 focuses on freight forwarders. As it can be seen, the biggest probability among with the highest impact has shown for human reluctance factor, in other words, resistance for a change. The highest impact in this case is determined by the forwarders' role of the electronic messages originator. Process coordination took the middle position. In this case, process coordination is the ability to coordinate processes when still some paper documents in use, but electronic messages start to replace them. Therefore, freight forwarders are responsible for making these processes as smooth as possible. Another Nil-Low placement of a reverse situation factor shows that actually, once electronic messages are fully integrated, there is the lowest probability to go back to the paper-based processes. But still this situation theoretically exists when stakeholder finds out that printing and delivering a paper version of a document in some special cases might work better.

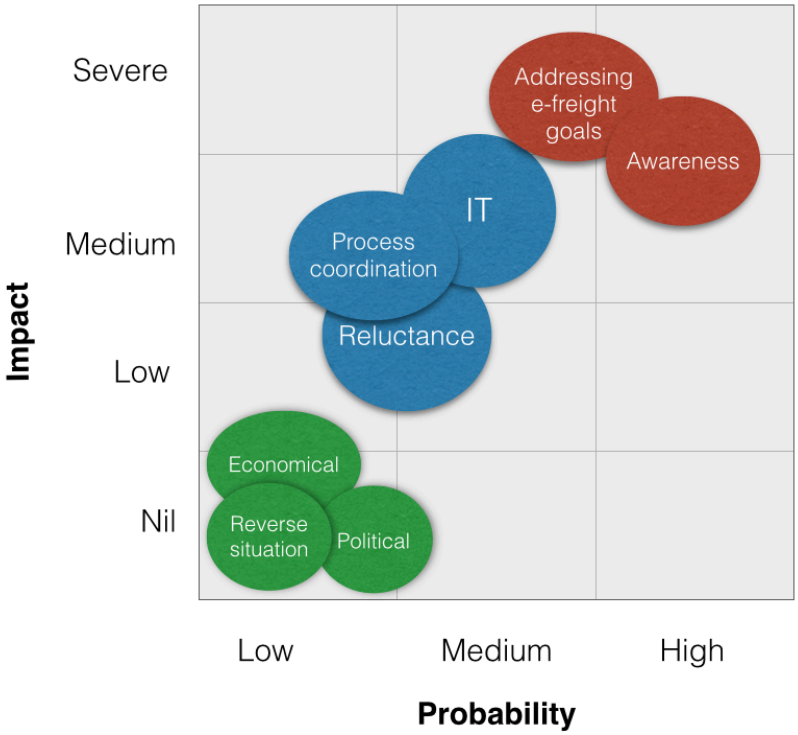


Figure 44. Risks matrix for Pillar II, GHAs.

Risk matrix for GHA stakeholder (Figure 44) depicts that the most probable risks for successful e-freight implementation in the industry-wide scale are based on the raising awareness towards paperless change and addressing e-freight goals, as GHAs are responsible for closing the mistakes that appears beforehand.

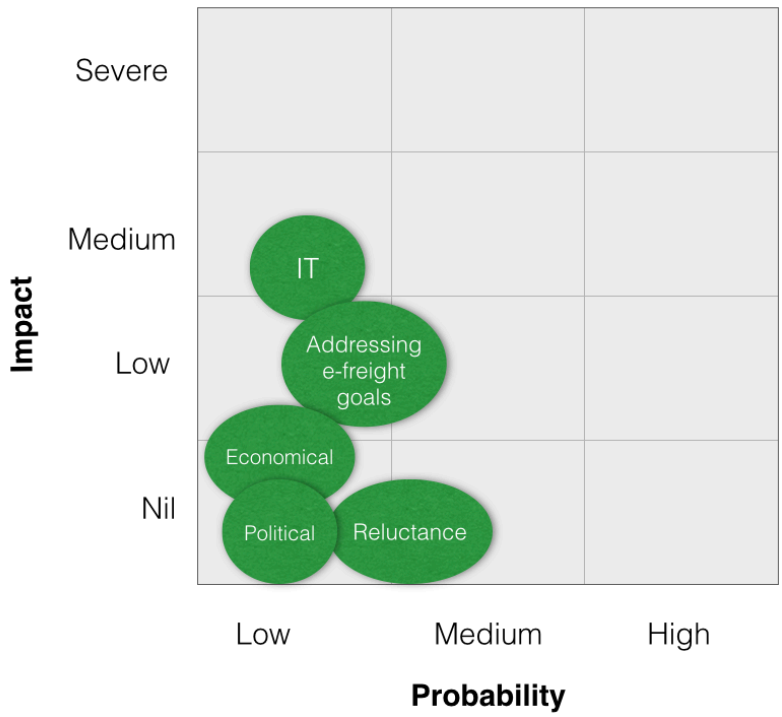


Figure 45. Risks matrix for Pillar II, Carriers.

Figure 45 represents risks that might be caused from and for carrier side. As it can be noticed, there are quite few factors affecting airlines capability to implement e-freight successfully. But still, with the low probability and impact. Basically, it is caused by the airlines involvement in the industry-wide projects as e-freight, and not less important factor is that airlines, as it was previously discussed, almost do not create a waste. Therefore, quite small chances to have a risk from their side and for them.

Summarizing this subsection, there were different risks identified from the different perspectives of Pillar II. Presented risk matrixes make possible to visualize the situation and to react accordingly to the level of a risk in each single case.

4.3.3 Pillar III

Pillar III is set with a purpose to remove core commercial documents, to enable paper-less door-to-door chain (Figure 46). It is lead by IATA project management in close cooperation with FIATA. In other words, Pillar III drives the change towards removing of a document pouch flowing from shipper to consignee.

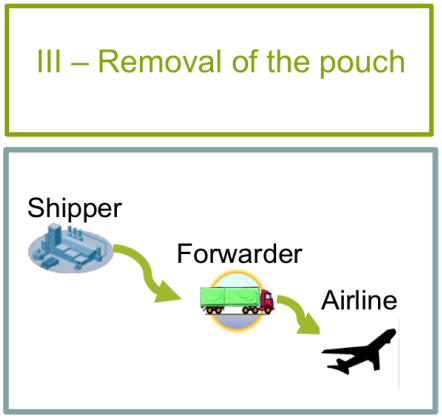


Figure 46. Pillar III (IATA Website, 2014).

In consequence of the study limitations, no direct communication had place with representatives of any consignor or consignee to trace most probably barrier from their side, or for them. But still, the general viewpoint expressed by other stakeholders narrowed down to the fact that shippers are basically not reluctant for a change. From the side of information technologies availability it is essential to highlight that shippers' roles usually performed by big companies or organizations. Therefore, some investments into IT systems upgrades are the lowest in comparison to other air cargo supply chain players. When talking about creating commercial documents, shippers are interested in "as fast as possible" delivery of their goods to the final destination. Therefore, shipper is one of the most engaged players for fast, qualitative and sustainable services. From the other side, supply chain members by providing shipper with the fastest and reliable services

can differentiate themselves on a market of cargo services, consequently, to build stable business relationships or gain a greater market share. Risk matrix for a shipper shows the most vital factors (Figure 47).

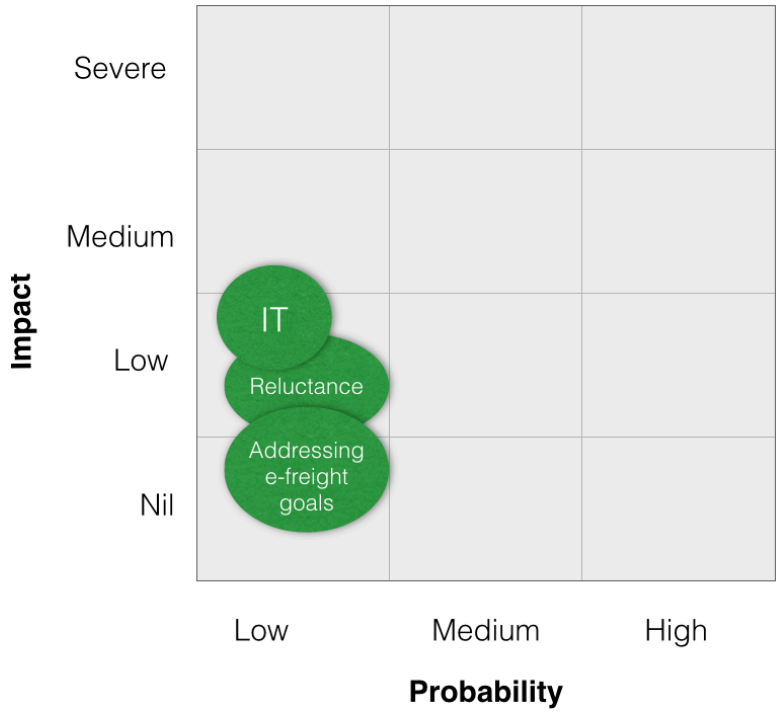


Figure 47. Risks matrix for Pillar III, Shipper.

As presented in Figure 47, there are basically only Low-Nil and Low-Low zones occupied with possible risks of IT non-readiness, reluctance or addressing e-freight goals of paperless cargo.

4.3.4 Strategic and operational perspectives

To get a broader picture on how different risks and barriers are reflected considering interdependencies on operational and strategic levels of companies interacting in air cargo supply chain, this subsection reviews some of the findings.

First highlight is referred to the challenge for e-freight successful implementation as getting all on board. *Forwarder* says: *"There is seemingly an unaccounted challenge of getting all initiative participants involved into the project"*. From the previously shown risk matrixes, reluctance for a change is demonstrated from quite many sides. And this factor describes the industry climate, where risks can be as customer based as individual based (individual resistance for innovative changes, etc.) As a way to prevent industry from resistance, joint forces formation can be considered as a driving force for a significant move to this desired direction. Carrier pointing that not so many years ago industry was profoundly ignorant to the barcodes integration, this is an illustrative example from

the past of air cargo industry when any change was challenging. But nowadays it is impossible to imagine a freight move without barcodes. Therefore, role of united powers is a fundamental idea for any industry change.

Another hazard towards the common change for management level is mentioned for processes coordination. *"There are too many players: airlines, agents, forwarders…coordination is challenging"*, *Carrier* concludes. All participants have their own opinions about the way processes are organized, own standards for operational activities. *"Huge country level implements are challenging and can be done only if there is a full consensus achieved or national carrier has a big market share"*, *Carrier* adds. Summing on top the international focus of air cargo business, efficient coordination becomes an invaluable issue. Nowadays transportation industries face multimodal trends where a use of all transport modes is combined for cargo delivery. In fact, cargo can be transported by air, sea and road on its way from a shipper to consignee. These multiple ways of transportation are determined by the costs reasons, but it drastically increases the level of complexity in supply chains and their coordination. In such cases, *"…employees' awareness should be raised towards being paperless"*, proposes *Carrier*. It encourages all human resources to pay higher attention on quality issues and to achieve a way better performance.

Next risk to be discussed is accurate information availability as a tool to avoid high costs and low quality consequences. In particular, airlines quite often face a challenge to know a real state of a country readiness for its foreign stations. Most operations are outsourced that results in filtered information received. *Carrier* with a high level of concern summarizes: *"To implement e-freight for not ready markets will cost quality issues, therefore, probability of loosing business cases"*. Consequently, dependency on information is countless to see the real situation and to enable planning activities for company management. As a part of information shortage or its supply, question about suitability of e-freight as a profitable investment takes critical place. When searching for barriers that can affect the way management leaders support or do not support e-freight project, the next barrier was identified. It can be described as a low motivation from companies' management side to support e-freight due to the prioritizing fast profit decisions than getting long-term benefits. In some way it really prevents a support from management side and places all the project benefits to a postponed shelf.

But what then connects all operational activities performed by different stakeholders and unifies the risks? The answer is highly risky operations that include same time processing of paper documents and electronic messages. As it was mentioned in the previous subsections, some stakeholders may remain reluctant or just be not ready for electronic standards, therefore, it requires multiple ways of processes - both manual and electronic for the same shipments. And, of course, it stipulates high chance of operational mistakes. In a very general, air cargo industry is not going to be shaped with e-

freight implementation, but *"...on the operational level it is the biggest progress since the times computers entered the business - better quality, improved tracking systems, better service for the end customer"*, comments Hellen Petteri, manager of e-Solutions, commercial partners and global mail at Finnair Cargo. Summarizing, Figure 48 presents the findings related to strategic and operational levels.

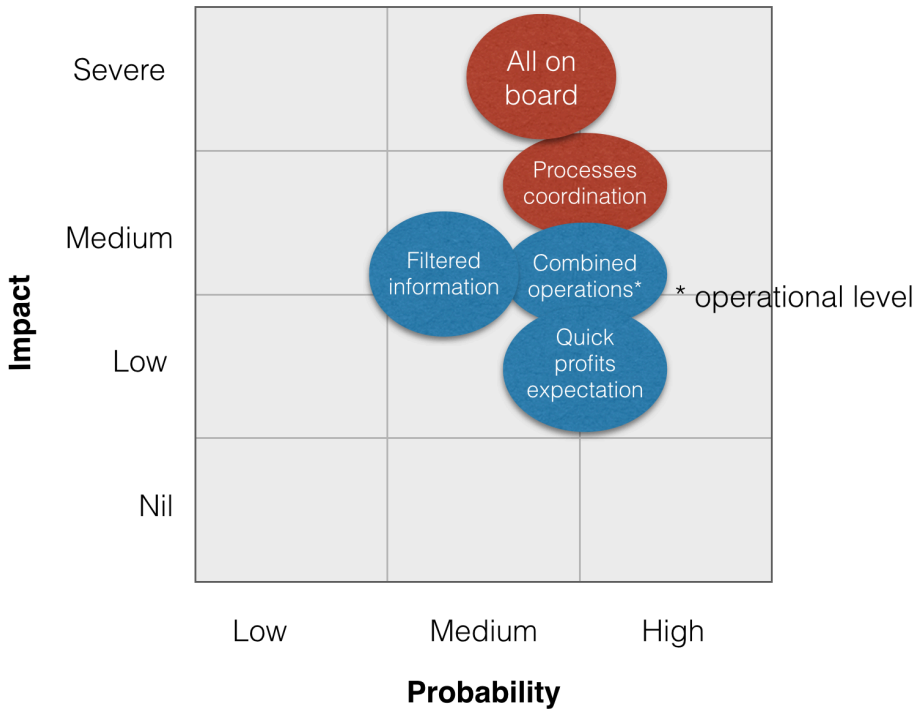


Figure 48. Strategic and operational level risk matrix for e-freight.

On contrary, when talking about strategically positive results, there is also a tendency for long-term results instead of getting anything at hands, especially it is applied to e-freight implementation phase. For operational people, there are no visible results as soon as they consider that e-freight project changes the way operations are performed, but not a way of doing business. But, if digging deeper, there are plenty.

First of all, e-freight allows reducing operational costs for multiple data entry. More to say, data quality becomes better because all original data will flow through the whole chain without a need for reentering it into different IT systems. It also has a positive influence for a fuel usage and, of course, paper savings. In yearly period it can result in tens of thousands Euros savings. At the same time improved IT solutions will result in shortening working times for operations and, therefore, can be effectively used for redirecting resources for quality improvements in other fields. Another aspect is environment improvements that can be successfully utilized for extended and purposeful marketing campaigns. Bringing more extended customer groups is also an opportunity e-freight will bring to the industry. Connecting parties with no more intermediaries is the opportunity due to new companies rising, and it enables to cover the whole supply

chain. Especially, it allows touching smaller customer groups as done by integrators. Summarizing this idea, e-freight can promote business shift from B2B (business-to-business) segments to B2C (business-to-consumer) world.

5. CONCLUSIONS

5.1 Risk management for IATA e-freight initiative

This thesis discusses the risks and interdependencies in air cargo supply chains that accompany the process of e-freight implementation. Study is based on the material gathered from the Finnish air cargo industry as an illustrative and typical example of an industry that currently actively supports a change to full digitalization of previously paper-based operations.

In the first Chapter introduction to the topic and the scope of the paper are established. The detailed description of research purpose, design, data collection methods and actual research process are described in the next Chapter. The third Chapter is considered as the most crucial, it gives theoretical implications that discuss and introduce main concepts of supply chains and risk management practices. Different sections present theories that have a direct relation to the real business processes. So, current air cargo supply chains, innovative e-freight project and risk management practices are discussed. This background helps to build interconnections in order to enable getting a full picture on chosen theme. As the result, theoretical part ends with a model representation that aims to connect theories into the practically applicable tool for air cargo industry.

The provided model shows the basic way how complex supply chains communicate and impact in some way operational and strategic organizational levels when they place in operation the e-freight industry-wide project. This helps to understand how industry shapes and what kinds of tendencies follow the implementation phase. The model is generalized and can be applicable to other industries where supply chains are highly interconnected and industry-wide initiatives are centrally coordinated. E-freight is a project on a global scale, therefore, much smaller industries can successfully implement the ideas of paperless processes.

The fifth Chapter, finally, allows applying earlier developed model to investigate and analyze risks in Finnish air cargo industry. In fact, author focuses firstly on identifying risks that belong to the e-freight project successful implementation from different stakeholders' points of view. And then, it becomes possible to generalize risks that in some way impact strategic plans and operational procedures of interconnected players. Next subsection presents the actual findings of this study that were gained through the close collaboration with Finnish air cargo supply chain representatives.

5.2 Results of the study

There have been many researchers publishing their scientific works about the supply chains, their complexities, risk management practices and interdependencies in them. Over years, supply chains as well as risk management topics were evolving to respond to the most contemporary trends in industries worldwide. The most visible changes appeared at times of integrating IT solutions into all logistics operations and ability to coordinate processes in a remote mode. Since that time quality improved, waiting times shortened and communication became easier. In particular, e-freight project initiated by IATA introduces a completely new way of doing cargo business, it promotes digitalized way aiming to eliminate manual operations referred to paper documentation handling.

Modern ways of doing business dictate the trends in risk management practices, they constantly evolve accordingly. But still, basic principles remain classic (such as risk management process model) and the changes touch mostly the nuances in different cases. In case of e-freight, IATA developed the plan for implementation, created a solid normative and standards base, turned into reality legislative base for accepting digitalized documents and made this project ready for realization globally. Nuances, at the same time, mostly suggested as country-specific. Risks that appear for e-freight implementation vary significantly between developed or developing countries, between supply chain stakeholders motivated for a change and completely reluctant for it. Therefore, this paper presents findings related to the Finnish air cargo industry with its nuances.

First of all, this study shows how different members of air cargo supply chain see the risks associated with other stakeholders involved in e-freight implementation process. For a greater visibility, study follows the proposed “three-pillar” structure to group chains according to e-freight roadmap. Viewpoints are different, but there are visible tendencies that help to conclude on the following results:

- Customs/regulators and freight forwarders as supply chain members are the most reluctant towards e-freight project implementation;
- Customs, small freight forwarders and ground handling agents are the most risky in terms of addressing e-freight goals such as deadlines, full e-freight and global covering;
- Capability of required information technologies use is under the threat coming from freight forwarders side;
- Ground handling agent is considered as the most risky part when evaluating awareness towards the paperless processes;
- Carriers, shippers and consignees are the most flexible to the industry changes and less subjected to risk factors.

In turn, when tracing the less probable and less harmful risks, the following tendencies appear:

- Economical and political situations are among the most impossible factors that can affect e-freight successful implementation from all stakeholders' sides; Inconspicuously higher risks potential noticed for customs/regulators;
- Reverse situation (going back to paper-based processes) can be customer-based, but still accounts for minimal potential.

In generalized picture for interdependencies that doubtless affect existing flows between supply chain members, there are two main categories identified: risks affecting strategic level decisions:

- Getting all air cargo supply chain stakeholders on board to address a need of full digitalization;
- Processes coordination complexities;
- Receiving non-complete or filtered information from the source;
- Quick profits anticipations.

And, operational level:

- Combined (paper-based and paper-free) operations.

Achieved results allow evaluating the industry's most vulnerable places and helping to develop solutions for their minimization. It becomes achievable due to the fact of risks distribution between parties and localized pointing of the gaps between current and desirable e-freight statuses for each of stakeholders.

5.3 Limitations of the study

Topic of e-freight as an innovative industry-wide initiative is a central focus of this study. Different players comprising air cargo supply chain, and e-freight project implies on their great involvement into changes towards paperless initiative. It can be seen that the presented air cargo supply chain players are manufacturers, companies, airlines and customs. Additionally, an important highlight is that air transportation is usually used for international transportation, therefore, parties are physically located in different countries or continents. Therefore, first limitation to this study is defined as a shortage of data from a source. Mainly, it is referred to limitation for customs/regulators accessibility, shippers and consignees physically remote locations.

Another limitation belongs to risk management process as a whole. As it is discussed in a paper, risk management process consists of few steps starting from risks identification

till risks monitoring and review. However, paper's focus is on the first steps - risks identification and risks analysis as the most critical. This position is supported by the vision that at the moment industry becomes fully involved into e-freight implementation, and, it is critical to observe separate stakeholders' risks and common risks from the industry perspective. All further steps such as risks evaluation, control and monitoring are individually based and proposed for a further research.

Present-day literature sources widely discuss risk management and supply chain risk management topics in general. IATA e-freight project was developed as initiative that is pushed for global integrated for air cargo companies. It is not a question of deciding on "go" or "not-go" decision, it is a project that is on a run nowadays. Therefore, risks identification and their analysis are somehow hidden from open literature sources or just not placed as something worth paying attention (why to analyze risks if industry anyway starts e-freight project). Consequently, limitation in direct literature sources had place when gathering all the relevant information.

Finally, author pays attention to the fact of a strong reluctance of industry representatives to talk and to share opinions about risks associated with e-freight implementation. Finnish air cargo industry consists of thousands of organizations, and Internship at Lufthansa Cargo (Helsinki) made possible to contact many companies asking for their support. Unfortunately, only few companies agreed on cooperation and contributed significantly in topic discussions.

5.4 Suggestions for further research

This thesis introduced a way to explore risks while industry-wide project implementation, which has been applied within one particular Finnish industry. Amount of respondents supported this research is limited due to the time constraints and shortening in contacts availability. As a proposal, further research can be based on covering a broader amount of supply chain members including customs, shippers and consignees. However, it could also be beneficial and thought provoking to test designed model for other places and countries, in order to get more feedback on a way it works.

Furthermore, this thesis gives suggestions for further research. In particular, it is logical to continue risks identification and risks analysis with other steps of risk management process to get a broader picture on the risks consequences. More to say, this paper showed general perspective on common risks' influence on the strategic and operational levels, this idea can be discussed in detail to understand more deeper interdependencies in supply chains.

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APPENDIX

INTERVIEWEES OF THE STUDY

Date	Supply chain member	Position	Company
17.06.2014	Carrier	Handling Manager, Finland and Baltic States	Lufthansa Cargo
17.06.2014	Carrier	Supervisor Flight Control, Finland and Baltic States	Lufthansa Cargo
25.06.2014	Forwarder	Air Operations Export	CHS Logistics
26.06.2014	Forwarder	Air Export Manager	Expeditors
07.07.2014	GHA	Cargo Operational Agent	Swiss Port
10.07.2014	Carrier	Country Manager Finland	Lufthansa Cargo
15.07.2014	GHA	Cargo Operational Agent	Swiss Port
25.08.2014	Carrier	Manager of e-Solutions, commercial partners and global mail	Finnair Cargo

INTERVIEW QUESTIONS AND QUESTIONNAIRE CONTENT

Industry-wide questions addressed to: **Carrier** **GHA** **Forwarder**	• e-freight is the industry wide project with the aim to build and implement end-to-end paperless transportation process for the air cargo industry. Among with the benefits it promises to bring, do you see any kind of unaccounted challenges in it? • In your opinion, what are the barriers for the smooth implementation of e-freight in the industry (eg human reluctance factor, weak process coordination, IT issues, change in economical situation, business seasonal instability, etc.)? And if possible, could you please rate and place them from the biggest to the lowest. • If taking the whole supply chain, what players are the most reluctant to the paperless initiative and why?

	• If taking the whole supply chain, which stakeholder may be considered as the most risky in terms of the full response to the e-freight Roadmap? • Is a reverse situation possible? (for example, when once eAWBs process started in a company, something can force a company to come back to the paper-based processes) • Could you please share your opinion is e-freight project initiative will shape the air cargo industry drastically?
Business-wide questions addressed to: **Carrier** **GHA** **Forwarder**	• Do you believe that e-freight project implementation will lead to the strategically positive results for the company business processes? • What are the biggest challenges for you, as for Carrier/GHA/Forwarder, to implement e-freight effectively and according to the IATA timeline? • Do you believe that implementation of e-freight will lead to the fact that operational processes will be eased and less workpeople will be needed? • How companies' operational processes dependent on interconnectivity with other supply chain members?